Australia's legal frameworks for biodiversity conservation: facilitating adaptation in a rapidly changing world

by

Phillipa C McCormack
BA/LLB (First Class Hons)

Faculty of Law

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Statement of candidate

Declaration of originality

This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of my knowledge and belief no material previously published or written by another person, except where due reference is made in the thesis, nor does the thesis contain any material that infringes copyright.

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Phillipa Cathryn McCormack

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Abstract

Australia is one of the most biodiverse countries on Earth. However, despite well-established legal frameworks for conservation, its biodiversity is in rapid decline. This national 'biodiversity crisis' will be exacerbated by long-term climate impacts such as sea level rise and species redistribution. Climate change will also compound the impact of existing threats such as invasive species and changing fire regimes. Australian biodiversity must adapt as the climate changes, to avoid increasing rates of species extinction and ecosystem collapse. Despite a growing understanding of the implications of climate change for biodiversity, there has been little consideration of how existing legal frameworks for conservation either facilitate or hinder climate adaptation by species and ecosystems.

This thesis addresses this gap, using the adaptation strategies most commonly advocated in conservation scholarship as a lens to investigate Australian conservation laws and policies for facilitating climate adaptation. The adaptation strategies are: (1) increasing and enhancing the protected area estate; (2) improving landscape connectivity; (3) reducing non-climatic stressors; (4) translocating organisms at risk of extinction; and (5) engaging proactively with *ex situ* conservation. This analysis shows that while each adaptation strategy is present in Australia's law and policy, none are designed to respond to climate change or facilitate climate adaptation.

This analysis also finds that conservation paradigms underpinning existing laws contribute to the lack of targeted adaptation laws. These paradigms embed a static concept of 'nature' and emphasise the value of 'wild' nature removed from human influence. Implementation of each adaptation strategy demonstrates additional limitations, including a lack of clarity about desirable conservation outcomes for biodiversity and a consistent failure to adequately legislate, implement or achieve adaptive management processes and outcomes.

This thesis proposes three principles to guide legal reform. Conservation laws must embody proactive conservation approaches, improve legal flexibility without reducing accountability, and prioritise adaptive management for biodiversity conservation. This novel approach provides practical insights for improving the way adaptation strategies are implemented in Australia, with lessons for countries facing similar conservation challenges under climate change.

Acronyms and abbreviations

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
ALGA	Australian Local Government Authority
ANEDO	Australian Network of Environmental Defenders Offices [see EDO]
ANZECC	Australian and New Zealand Environment Conservation Council
BOM	Bureau of Meteorology
CAR	Comprehensive, Adequate and Representative [criteria for expanding Australia’s protected area estate]
CBD	Convention on Biological Diversity
CITES	Convention on International Trade of Endangered Species of Wild Fauna and Flora
CMA	Catchment Management Authority
CMS	Convention on the Conservation of Migratory Species of Wild Animals
COAG	Council of Australian Governments
CSIRO	Commonwealth Industrial and Scientific Research Organisation
Cth	Commonwealth of Australia
DELWP	Victorian Department of Environment, Land, Water and Planning
DPIPWE	Tasmanian Department of Primary Industries, Parks, Water and the Environment
EDO	Environmental Defenders Office [Australian non-for-profit environmental community legal centres]
EJA	Environmental Justice Australia [formerly EDO Victoria]
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EU	European Union
FPS	Tasmanian Forest Practices System
IPA	Indigenous Protected Areas
IUCN	International Union for the Conservation of Nature
JAMBA	Japan-Australia Migratory Bird Agreement
JANIS	National Forest Reserve Criteria [the equivalent of CAR for forest areas]

KBA	Key Biodiversity Area
LGA	Local Government Authority
NCCARF	National Climate Change Adaptation Research Facility
NGO	Non-Government Organisation
NRM	Natural Resource Management
NRS	National Reserve System
NSW	New South Wales
NT	Northern Territory
NZ	New Zealand
Qld	Queensland
RFA	Regional Forest Agreement
RQ	Research Question [numbered I – V]
SA	South Australia
SLATS	Queensland Government Statewide Landcover and Trees Study
SMART	Specific, Measurable, Achievable, Realistic and Timebound
SotE	Commonwealth 'State of the Environment' report, released every 5 years
Tas	Tasmania
TNPA	Tasmanian National Parks Association
TWWHA	Tasmanian Wilderness World Heritage Area
US	United States
Vic	Victoria
VPP	Victorian Planning Provisions [standard planning provisions under the Victorian planning scheme]
VNPA	Victorian National Parks Association
WA	Western Australia
WWF	World Wide Fund for Nature

Acknowledgments

I have had the great privilege of excellent PhD supervision, unshakeable family support, and a home in one of the most beautiful places in the world: the perfect context for a very taxing task. An acknowledgement section can never capture how much tea, chocolate, tears and debriefs it takes to get through a PhD, but I know that I have been well cared for in this process, and I am immensely grateful.

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My 'office buddies', the now-Drs Emma van Dykken, Meg Good and Kerryn Brent, each shared my love of coffee and snacks, generously passed on thesis tips, and seemed (or pretended) not to notice me talking to myself while I work. I continue to appreciate their ongoing support and friendship. I am also immensely grateful for the support of my dear friend Lynna, who started her PhD two days before me, had a second child two months before I had my first, and has shared the family/thesis juggle. Our pep talks and commiserations have motivated and sustained me, and my PhD journey will not feel entirely complete until hers is too.

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And my beloved, Robb. He helps me keep everything in perspective, always chooses the music, and reminds me that I need time away from my computer. He has borne the brunt of the highs and lows of this project, and would probably argue that he knows the core of the thesis as well as I do. He has certainly sat patiently through years of mind maps, monologues and confusion as my ideas have been forming. He has regularly taken the lead in parenting, taught me not to worry when the dishes don’t get done, supported me financially and emotionally, and designed and helped to build a more delightful home than I could ever have imagined, for Henrietta and I to play hide-and-seek in. Let’s have a holiday, Robb.

Peer-reviewed publications

In the course of writing this thesis, the candidate has had the following peer-reviewed articles published or accepted for publication. These articles draw on ideas, data and argument developed in this thesis, and they are referenced throughout.

McCormack, Phillipa and Jan McDonald, 'Adaptation strategies for biodiversity conservation: has Australian law got what it takes?' (2014) 31 *Environmental and Planning Law Journal* 114

McDonald, Jan, Phillipa C McCormack, Aysha J Fleming, Rebecca M B Harris and Michael Lockwood, 'Rethinking legal objectives for climate-adaptive conservation' (2016) 21(2) *Ecology and Society* 25

McDonald, Jan, Phillipa C McCormack and Anita Foerster, 'Promoting resilience to climate change in Australian conservation law: the case of biodiversity offsets' (2016) 39(4) *UNSW Law Journal* 1612

Lee, Emma, Phillipa C McCormack, Pamela Michael, Shaun W Molloy, Tero Mustonen, Hugh Possingham, 'The language of science: essential ingredients for indigenous participation' (2016) 10 *[square brackets]* 22

Bonebrake, Timothy C et al, 'Managing consequences of climate-driven species redistribution requires integration of ecology, conservation and social science' (2017) 93(1) *Biological Reviews* 284

Pecl, Gretta T et al, 'Biodiversity redistribution under climate change: impacts on ecosystems and human well-being' (2017) 355(6332) *Science* eaai9214-1

McCormack, Phillipa C, 'Conservation introductions for biodiversity adaptation under climate change' (2018) (first view online) *Transnational Environmental Law* 1

McCormack, Phillipa C, 'The legislative challenge of facilitating climate change adaptation for biodiversity' (2018) *Australian Law Journal* (forthcoming)

Statement of coauthorship

This thesis adopts the traditional thesis format. However, chapters three, four and eight draw on peer-reviewed articles that were published or accepted for publication during the course of the candidature.[1] The candidate is the sole author of the articles drawn on in chapters four and eight. The article drawn on in chapter 3 was co-authored by the candidate and primary supervisor. The following people contributed to the publication of that published work:

Phillipa C McCormack, Faculty of Law (candidate)
Professor Jan McDonald, Faculty of Law, University of Tasmania (supervisor)

Author details and their roles:

Phillipa McCormack and Jan McDonald, 'Adaptation strategies for biodiversity conservation: Has Australian law got what it takes?' (2014) 31 *Environmental and Planning Law Journal* 114-136

Phillipa McCormack was the primary author and responsible for 100% of the source collection and approximately 70% of the drafting, analysis and interpretation of the research. Jan McDonald contributed to the research design and the drafting, and critically revised the paper prior to its submission.

We the undersigned agree with the above stated 'proportion of work undertaken' for the above published peer-reviewed manuscript contributing to this thesis:

Signed:

Professor Jan McDonald
Supervisor
Faculty of Law
University of Tasmania

Date: 18 January 2018

Professor Gino Dal Pont
Head of School
Faculty of Law
University of Tasmania

19 January 2018

[1] Permission from the publishers to use each article in this thesis is included in Appendix 6.

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Chapter 1 Introduction

1.1 Introduction

In 2014, the Bramble Cay melomys (*Melomys rubicola*), a small, native Australian rodent, was declared extinct.[1] The melomys is the latest in a long list of mammal extinctions in Australia,[2] but it stands out as the first mammal in the world reported to have become extinct 'solely (or primarily) as a result of anthropogenic climate change'.[3] The melomys had inhabited a single, low lying island in the Torres Strait and, between 2004 and 2014, sea level rise reduced its habitat by 97%.[4] Severe weather and storm surges appear to have literally washed the animals away.[5]

The melomys may be the first mammal species lost to climate change but it will certainly not be the last. The Earth is now in the early stages of what experts have described as the 'sixth mass extinction' and an international biodiversity 'crisis' driven primarily by human activities.[6] Legal frameworks have an important role to play in responding to this crisis. In particular, biodiversity conservation laws must be equipped to facilitate climate adaptation by species, ecological communities and ecosystems.

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[1] Department of Environment and Science, Queensland Government, *Animal Species Profiles: Bramble Cay melomys* (2017) <https://www.ehp.qld.gov.au/wildlife/threatened-species/endangered/endangered-animals/bramble_cay_melomys.html>; the species is still listed as 'endangered' under national legislation.
[2] Woinarski JCZ, AA Burbidge and PL Harrison, 'Ongoing unraveling of a continental fauna: decline and extinction of Australian mammals since European settlement' (2015) 112(15) *PNAS* 4531.
[3] Gynther I, N Waller and LK-P Leung, *Confirmation of the extinction of the Bramble Cay melomys Melomys rubicola on Bramble Cay, Torres Strait* (Unpublished report to the Department of Environment and Heritage Protection, Queensland Government, 2016) 27; Waller Natalie L et al, 'The Bramble Cay melomys *Melomys rubicola* (Rodentia: Muridae): a first mammalian extinction caused by human-induced climate change?' (2017) 44(1) *Wildlife Research* 9, 18.
[4] Bramble Cay is a small, isolated sand cay located north east of the Australian mainland, reaching just 3 metres above sea level at its highest point, Australian Government, *Species Profile and Threats Database: Melomys rubicola* (Department of the Environment, 2017) <http://www.environment.gov.au/sprat>.
[5] With major threats to the species recorded as 'habitat loss due to erosion of the cay and direct mortality from storm surges', Waller et al, above n 3, 9.
[6] With the pace and international scale of biodiversity loss of a magnitude unparalleled for 65 million years, Hoag H, 'Confronting the biodiversity crisis' (2010) 38(4) *Nature Reports Climate Change* 51; IUCN Red List of Threatened Species, *Why is biodiversity in crisis?* (3 September 2010) <http://www.iucnredlist.org/news/biodiversity-crisis>; Ceballos G et al 'Accelerated modern human-induced species losses: entering the sixth mass extinction' (2015) 1(5) *Science Advances* e1400253, e1400256; Barnosky AD et al, 'Has the Earth's sixth mass extinction already arrived?' (2011) 471(7336) *Nature* 51; Wake DB and VT Vredenburg, 'Are we in the midst of the sixth mass extinction? A view from the world of amphibians' (2008) 105(1) *Proceedings of the National Academy of Sciences* 11466; Maxwell Sean L et al, 'The ravages of guns, nets and bulldozers' (2016) 536 *Nature* 143.

Conserving biodiversity is recognised in international and domestic legal frameworks as a critically important task.[7] International and bi-lateral conservation treaties, and domestic legislation around the world, establish goals and legal mechanisms to conserve habitats, wetlands and ecosystems[8], and to protect endangered species and migratory species from extinction. [9] However, these laws and agreements have been unable to address many of the most significant threats to biodiversity.[10] These threats include overexploitation, unsustainable extractive land uses and broad scale land clearing[11] and, especially in Australia, inappropriate fire regimes and the spread of feral predators such as cats and foxes.[12] Climate change is now emerging as a threat to biodiversity that is more complex and challenging than any other.[13]

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[7] Secretariat of the Convention on Biological Diversity, *Global Biodiversity Outlook: A mid-term assessment of progress towards the implementation of the Strategic Plan for Biodiversity 2011-2020* (2014) <https://www.cbd.int/gbo/gbo4/publication/gbo4-en.pdf>; Hajkowicz Stefan, Hannah Cook and Anna Littleboy, *Our future world: global megatrends that will change the way we live* (CSIRO, 2012) identifying biodiversity decline as one of six megatrends that 'will have a major impact on Australia over the next 20 years'.

[8] *Convention on Biological Diversity*, opened for signature 5 June 1992, 1760 UNTS 79 (entered into force 29 December 1993) ('CBD'); *Convention concerning the Protection of the World Cultural and Natural Heritage*, opened for signature 16 November 1972, 1037 UNTS 151 (entered into force 17 December 1975) ('world heritage convention'); *Convention on the Conservation of European wildlife and Natural Habitats*, opened for signature 19 September 1979, 1284 UNTS 209 (entered into force 1 June 1982) ('Bern convention'); *Convention on Wetlands of International Importance especially as Waterfowl Habitat*, opened for signature 2 February 1971, 996 UNTS 246 (entered into force 21 December 1975) ('Ramsar convention); *EU Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora* [1992] OJ L 206/7 ('EU Habitats Directive'); *Environment Protection and Biodiversity Conservation Act 1999* (Cth); *Water Act 2007* (Cth).

[9] Eg CBD, above n 8; *Convention on International Trade in Endangered Species of Wild Fauna and Flora*, opened for signature 3 March 1973, 993 UNTS 243 (entered into force 1 July 1975) ('CITES'); *Convention on the Conservation of Migratory Species of Wild Animals*, opened for signature 23 June 1979, 1651 UNTS 333 (entered into force 1 November 1983) ('CMS'); *EU Directive 2009/147/EC on the Conservation of Wild Birds*, [2009] OJ L 20/7 ('EU Birds Directive'); *Japan Australia Migratory Bird Agreement*, opened for signature 6 February 1974, [1981] ATS 6 (entered into force 30 April 1981) ('JAMBA'); *Environment Protection and Biodiversity Conservation Act 1999* (Cth) ('EPBC Act'); *Endangered Species Act 1973* (United States); *Trade in Endangered Species Act 1989* (NZ).

[10] More than 60% of ecosystems around the world are already degraded or exploited unsustainably, Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Synthesis* (Island Press, 2005), 6; Watson JEM et al, 'Catastrophic declines in wilderness areas undermine global environment targets' (2016) 26(21) *Current Biology* 2929; Butchart SH et al, 'Global biodiversity: indicators of recent declines' (2010) 328(5982) *Science* 1164.

[11] Pogson B 'Habitat fragmentation reduces biodiversity' (2015) 347(6228) *Science* 1325; Cresswell ID and HT Murphy, *Australia State of the Environment 2016: Biodiversity* (Independent report to the Minister for the Environment and Energy, Commonwealth Government, 2017) <https://soe.environment.gov.au/theme/biodiversity> ('SotE 2016').

[12] Woinarski Burbidge and Harrison, above n 2; Steffen, W et al, *Australia's biodiversity and climate change: a strategic assessment of the vulnerability of Australia's biodiversity to climate change* (Biodiversity and Natural Resource Management Adaptation Team, Commonwealth Department of Climate Change, 2009) 26-70; SotE 2016, above n 11; National Land and Water Resources Audit, *Australian Terrestrial Biodiversity*

Australian national and state governments have developed legal frameworks for conservation to arrest biodiversity decline in this country. These laws, regulations, policies and conservation strategies have been implemented to establish a network of protected areas and to identify, list and prioritise for recovery, threatened species and ecological communities. Australian parliaments have also legislated controls on broad scale native vegetation clearing, and rules and risk assessment processes for biosecurity and quarantine. Conservation laws have achieved some positive outcomes in Australia, including creating and expanding Australia's protected area estate,[14] and successful threatened species reintroduction projects, especially in collaboration with the private sector.[15] However, these laws suffer from fundamental weaknesses, including fragmentation across political jurisdictions and bioregions; consistent shortfalls in funding;[16] implementation and enforcement failures; and the 'entirely conditional and provisional' nature of most protective provisions.[17]

The effects of climate change are expected to drive a growing number of species to extinction and ecological communities to collapse over coming decades.[18] To survive, species, ecological communities and ecosystems will need to adapt to rapid rates of change. However, Australia has no national legislation to guide adaptation-oriented decision making, and only one statute in Australia currently acknowledges the challenge of climate change for conserving biodiversity.[19] There is growing recognition that Australia's well-established conservation laws and policies are likely to be insufficient in their current

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Assessment 2002 (NLWRA, 2002) <www.audit.ea.gov.au/ANRA/vegetation/docs/biodiversity/bio_assess_contents.cfm>.

[13] Steffen et al, above n 12; Staudt A et al, 'The added complications of climate change: understanding and managing biodiversity and ecosystems' (2013) 11(9) *Frontiers in Ecology and the Environment* 494.

[14] Taylor MFJ, *Building nature's safety net 2016: the state of Australian terrestrial protected areas 2010-2016* (WWF-Australia, 2017).

[15] Eg SotE 2016, above n 11; Office of Environment and Heritage, NSW Government, *Saving our Species: reintroducing locally extinct mammals* (2017) <http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/saving-our-species-program/threatened-species-conservation>.

[16] Waldron A et al 'Targeting global conservation funding to limit immediate biodiversity declines' (2013) (110)29 *PNAS* 12144.

[17] Preston Brian J, 'Adapting to the impacts of climate change: the limits and opportunities of law in conserving biodiversity' (2013) 30 *Environmental and Planning Law Journal* 375, 376.

[18] Urban MC, 'Accelerating extinction risk from climate change' (2015) 348(6234) *Science* 571; Bellard C et al, 'Impacts of climate change on the future of biodiversity' (2012) 15(4) *Ecology Letters* 365; Root Terry L et al, 'Fingerprints of global warming on wild animals and plants' (2003) 421 *Nature* 57; Thomas Chris D et al, 'Extinction risk from climate change' (2004) 427(6970) *Nature* 145.

[19] The Australian state of New South Wales recently introduced the *Biodiversity Conservation Act 2016* (NSW), which includes some references to climate change, see Chapter 4.

form to conserve biodiversity as the climate changes,[20] a task that will require more than to 'do what we do now, but better'.[21]

In response to these challenges, this thesis asks the following question: *How can Australia's legal frameworks for biodiversity conservation facilitate adaptation as the climate changes?* This question is important because, despite growing understanding of the implications of climate change for biodiversity,[22] comparatively little research attention has been paid to how biodiversity will adapt, and how laws and policies might facilitate or hinder that adaptation.[23] In particular, there is limited existing analysis of the legal frameworks that will govern the development and application of proactive, strategic and ambitious adaptation-oriented conservation strategies.[24]

In order to address this research gap, this thesis straddles the scientific and legal disciplines, critically analysing conservation legal frameworks in the context of biodiversity adaptation strategies recommended by scientists. This critical analysis is guided by the following subsidiary research questions:

I. What conservation strategies, discussed in the international biodiversity conservation literature, are considered the most important for an adaptation-oriented approach to biodiversity conservation?

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[20] Environmental Defender's Office NSW ('EDO NSW'), *Climate change and the legal framework for biodiversity protection in Australia: a legal and scientific analysis discussion paper* (2009); Hawke, Allan, *The Australian Environment Act: report of the independent review of the Environment Protection and Biodiversity Conservation Act 1999* (Report to the Commonwealth Department of the Environment, Water, Heritage and the Arts, 2009); Preston, above n 17, 375; McCormack Phillipa and Jan McDonald, 'Adaptation strategies for biodiversity conservation: has Australian law got what it takes?' (2014) 31 *Environmental and Planning Law Journal* 114.

[21] Eg EDO NSW report, above n 20; McCormack and McDonald, above n 20.

[22] Eg SotE 2016, above n 11.

[23] Recent publications on climate change adaptation law often only include superficial mention of biodiversity adaptation, if any, eg Zahar Alexander, Jacqueline Peel and Lee Godden, *Australian Climate Law in Global Context* (Cambridge University Press, 2013); Swayne Nicola, *Legal Responses to Climate Change* (The Federation Press, 2010); Productivity Commission, *Barriers to effective climate change adaptation*, Report No 59 (2012); Godden Lee et al, *Legal Tools and Measures for Adaptation and Managing Climate Risk in Victoria* (Report to the Victorian Centre for Climate Change Adaptation Research, 2013); although one chapter is dedicated to this issue in each of Bonyhady Tim, Andrew Macintosh and Jan McDonald (eds), *Adaptation to climate change: law and policy* (The Federation Press, 2010) and Verschuuren, Jonathan (ed), *Research Handbook on Climate Change Adaptation Law* (Edward Elgar Publishing, 2013).

[24] *Cf* EDO NSW above n 20; EDO NSW, *Climate change and the legal framework for biodiversity protection in NSW: a legal and scientific analysis* (2009).

II. What does the literature suggest are the key characteristics of these strategies for enhancing biodiversity adaptation outcomes?

III. To what extent are these strategies currently represented in Australia's legal frameworks for conservation?

IV. To what extent do Australian legal frameworks for conservation hinder or promote the effective implementation of these strategies?

V. How can Australian law be reformed to improve the representation and implementation of these strategies?

The starting point for this research was to identify the biodiversity adaptation strategies that are most commonly recommended by conservation scientists to help species and ecosystems adapt as the climate changes ('adaptation strategies'). Drawn from two 2009 meta-reviews of peer-reviewed literature,[25] the five most commonly recommended adaptation strategies are: (1) increasing and enhancing the protected area estate; (2) improving landscape connectivity; (3) reducing non-climatic stressors; (4) translocating organisms at risk of extinction; and (5) engaging proactively with *ex situ* conservation. These adaptation strategies are described in more detail in Section 1.4.

To support climate adaptation, the adaptation strategies will need effective legal infrastructure or, at least, will need the removal of legal, institutional and policy barriers to their implementation.[26] This thesis examines existing Australian laws and policies for implementing each adaptation strategy.[27] In using the adaptation strategies as a lens to

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[25] Heller Nicole E and Erika S Zavaleta, 'Biodiversity management in the face of climate change: A review of 22 years of recommendations' (2009) 142(1) *Biological Conservation* 14; Mawdsley JR, R O'Malley and DS Ojima, 'A review of climate-change adaptation strategies for wildlife management and biodiversity conservation' (2009) 23(5) *Conservation Biology* 1080.
[26] Jantarasami LC, JJ Lawler and CW Thomas, 'Institutional barriers to climate change adaptation in U.S. national parks and forests' (2010) 15(4) *Ecology and Society* 33; Productivity Commission, above n 23; acknowledging that the law can play a significant role in facilitating or hindering adaptation, but that role should not be overstated, McDonald J, 'Creating legislative frameworks for adaptation' in Jean Palutikof et al (eds), *Climate adaptation futures* (Wiley-Blackwell, 2013) 126, 126.
[27] Research for this thesis underpinned the first publication to explore how the adaptation strategies are currently represented in, or hindered by, Australian conservation laws, McCormack and McDonald, above n 20; a similar discussion of Finland's laws – independent of this research – was published shortly afterwards, Borgström S, 'Helping biodiversity adapt to climate change – implications for nature conservation law in Finland' (2012) 1 *Nordic Environmental Law Journal* 31.

analyse legal frameworks, this thesis contributes a unique perspective on the adaptiveness of Australia's conservation laws, and offers a spectrum of legal reform proposals tailored to each strategy.

Before continuing further, it is necessary to provide a brief explanation of the terminology adopted in this thesis. This thesis adopts the broad definition of biodiversity from the Convention on Biological Diversity ('CBD'), which includes 'diversity within species, between species and of ecosystems'.[28] While the CBD definition encompasses marine diversity, this thesis focuses exclusively on legal frameworks for terrestrial and freshwater biodiversity conservation. Distinct legal frameworks apply to conservation for marine species and ecosystems and they raise discrete legal and ecological issues for climate adaptation. A detailed and comparative analysis of marine conservation law and policy is beyond the scope of this thesis.[29]

References throughout this thesis to the 'legal framework for conservation' are to legislation, delegated legislation,[30] case law, overarching strategies and implementing policies[31] for biodiversity conservation in Australia. The focus on conservation includes legal frameworks for protected areas, threatened species and ecological communities, species habitat and native vegetation. The thesis also refers to broader natural resource management laws that indirectly affect biodiversity, including for forestry, mining, dams and electricity generation, transport, and land use planning.[32] Laws with an indirect effect on biodiversity are critically important to the task of developing an integrated and adaptation-oriented approach to conservation under climate change, and improved regulatory integration and complementarity across sectors will be key to achieving

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[28] Including '…the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part', CBD, above n 8, Article 2; adopted in *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 3(1)(c); and see *Booth v Bosworth* (2001) 114 FCR 39.
[29] For future research directions, see Chapter 9, Section 9.3.
[30] Including regulations, planning schemes, statutory plans, biodiversity listing statements, and agency rules – eg for allocating public funding to policy priorities.
[31] Policies and strategies guide a great deal of conservation decision making in Australia, eg for the National Reserve System which is implemented through legislation at the Commonwealth and state scales, but priority setting and guidance for implementing legal instruments are provided by non-legal mechanisms such as, Australian Department of Environment and Energy, *Australian Guidelines for Establishing the NRS* <www.environment.gov.au/land/nrs/publications/plan-of-management-guidelines>.
[32] References throughout the thesis note the role of these indirect legal frameworks to climate adaptation and conservation but they are not the primary focus of the thesis.

effective adaptation outcomes for biodiversity.[33] However, it is not possible to undertake a detailed review of the adaptive characteristics of every law that is directly or indirectly relevant to biodiversity, and this thesis does not attempt such a task.

The remainder of this chapter proceeds as follows. Section 1.2 provides a more detailed introduction to the most important climate change implications for biodiversity, and the imperative to facilitate biodiversity adaptation. Section 1.3 locates this research at the intersection of legal and scientific scholarship on climate adaptation and biodiversity conservation. Section 1.4 concludes this chapter by introducing the thesis structure and the way that this structure underpins the answers to the research questions.

1.2 Implications of climate change for Australian biodiversity

Australia is one of the most biodiverse countries on Earth[34] and is home to approximately 600-700,000 individual species or 7-10% of all known species, a great many of which are found nowhere else.[35] There are 15 nationally recognised biodiversity hotspots, and both southwest Western Australia and the forests of eastern Australia have been identified as globally significant biodiversity hotspots.[36] Australia also has an unenviable record of biodiversity loss. For example, Australia has the highest mammal extinction rate in the world.[37] Approximately 20% of the continent's extant mammal species currently face extinction;[38] along with more than 1,200 plant species – 12% of the world's threatened

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[33] Ruhl JB, 'Climate change adaptation and the structural transformation of environmental law' (2010) 40 *Environmental Law* 363; Gunningham N and C Holley, 'Next-generation environmental regulation: law, regulation and governance' (2016) 12(1) *Annual Review of Law and Social Science* 273.
[34] Mittermeier RA, PR Gil and G Mittermeier (eds) *Megadiversity: Earth's biologically wealthiest nations* (Cemex, 1997); Australia and 16 other nations cover less than 10% of the planet's surface and contain more than 70% of its biodiversity, Australian Department of Environment and Energy, *Biodiversity hotspots*, <http://www.environment.gov.au/biodiversity/conservation/hotspots> ('Biodiversity Hotspots').
[35] Steffen et al, above n 12, 7; House of Representatives Standing Committee on Climate Change, Environment and the Arts, Parliament of Australia, *Managing Australia's biodiversity in a changing climate: the way forward* (2013) ('House of Representatives') 1; endemic species make up 84% of Australia's plant species, 83% of mammals, and 45% of birds, Biodiversity Hotspots, above n 34.
[36] Williams KJ et al, 'Forests of East Australia: the 35th Biodiversity Hotspot', in F Zachos and J Habel (eds) *Biodiversity Hotspots* (Springer, 2011); Critical Ecosystem Partnership Fund, *Hotspots: Asia Pacific* <http://www.cepf.net/resources/hotspots/Asia-Pacific/Pages/default.aspx>.
[37] 36 Australian mammal species (30) and subspecies (6) extinctions in total, representing half of the world's mammal extinctions over the last 200 years, Woinarski JCZ, AA Burbidge and P Harrison, *The Action Plan for Australian Mammals 2012* (CSIRO Publishing, 2014).
[38] 56 mammal species in total, with a further 52 'near threatened', Woinarski, Burbidge and Harrison, above n 2.

plant species.[39] Ecosystems and ecological communities are also under threat, with half of Australia's forests cleared since colonisation,[40] and south eastern Australia's temperate lowland grasslands reduced in extent by almost 99% over the past 200 years.[41] Despite these pressures, Australia is one of the most underfunded countries for biodiversity conservation in the world.[42]

Climate change is already an important driver of biodiversity decline, along with economic activity and population growth in Australia.[43] It is expected to become the primary driver of biodiversity decline in future.[44] The most significant impacts of climate change for biodiversity include temperature increases and changes in the location and timing of rainfall, triggering more frequent, severe and extended droughts, longer annual fire seasons, and more frequent and severe bushfires.[45] Ocean warming and rising sea levels will also underpin more extreme and harmful inundation, erosion and tidal events.[46]

These climatic changes have multiple and interacting effects on biodiversity.[47] The Intergovernmental Panel on Climate Change ('IPCC') has consistently identified natural

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39 Department of the Environment, Water, Heritage and the Arts, Commonwealth Government, *Numbers of living species in Australia and the world* (2nd edition, 2009) 7.
40 Bradshaw, CJA, 'Little left to lose: deforestation and forest degradation in Australia since European colonization' (2012) 5(1) *Journal of Plant Ecology* 109.
41 Australian Museum, *What's happening to Australia's biodiversity* <https://australianmuseum.net.au/whats-happening-to-australias-biodiversity>; SotE 2016, above n 11, 125.
42 Waldron et al, above n 16, demonstrating that Australia falls short of the very modest 'average country' spend on conservation by approximately $^1/_3$ of a billion dollars per annum, at 12146.
43 SotE 2016, above n 11, defines a 'driver' as 'the underlying natural and human-caused forces that generate pressure on the environment', <https://soe.environment.gov.au/theme/drivers>; Biodiversity Decline Working Group, *A national approach to biodiversity decline* (Report to the Natural Resource Management Ministerial Council, 2005) 18-9.
44 Steffen et al, above n 12; Cang F Alice, Ashley A Wilson and John J Wiens, 'Climate change is projected to outpace rates of niche change in grasses' (2016) 12(9) *Biology Letters* 20160368; Hughes Lesley, 'Climate change and Australia: trends, projections and impacts' (2003) 28(4) *Austral Ecology* 423.
45 Steffen et al, above n 12, 116-122; Williams RJ et al, *Interactions between climate change, fire regimes and biodiversity in Australia: a preliminary assessment* (Report to the Department of Climate Change and Department of the Environment, Water, Heritage and the Arts, 2009) 3; Reisinger, A et al, 'Australasia' in VR Barros et al (eds), *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the IPCC* (Cambridge University Press, 2014) 1371, 1375, 1390-2 ('IPCC AR5 Australasia').
46 Steffen et al, above n 12, 116-122; IPCC AR5 Australasia, above n 45, 1375-6, 1392-3; all of which are already being observed in Australia, Bureau of Meteorology ('BOM') and Commonwealth Science and Industrial Research Organisation ('CSIRO'), *State of the Climate 2016* <https://www.csiro.au/en/Showcase/state-of-the-climate> ('State of the Climate 2016').
47 Climate change is both an additional, direct stressor on biodiversity and an indirect stressor, exacerbating the effect of existing threats such as land clearing and changing fire regimes, Steffen et al, above n 12, 1;

ecosystems as more vulnerable to the negative effects of rapid climate change than any other target of IPCC assessment.[48] Many species' geographic distributions will shift or contract as their 'climatic niche' – the temperature, rainfall and other habitat conditions that they rely on – shifts or disappears.[49] Interactions between species will break down or change as changes to the timing of species' lifecycle events such as migration, spawning, flowering and reproduction have flow-on effects for the lifecycles of other species.[50] Some existing invasive species will expand their ranges under more favourable climatic conditions, and new – including some native – species will become invasive.[51]

Some areas will be at greater risk than others, and ecosystems may not be able to be replicated or protected in their existing form.[52] Coastal and estuarine species and their habitat will be particularly threatened, and in some cases lost, as sea levels rise.[53] Species and ecological communities located on low-elevation islands and at high latitudes and altitudes are also particularly vulnerable.[54] These climate change effects will lead many more species to become threatened, with threatened species facing a greatly increased risk of extinction.[55] Changes to species populations and their interactions will also have implications for the structure, composition, health and persistence of ecological communities and ecosystems;[56] with resulting ecological changes varying considerably across landscapes, bioregions and populations.[57]

Morton Steve, Andy Sheppard and Mark Lonsdale (eds) *Biodiversity: science and solutions for Australia* (CSIRO Publishing, 2014) 62.

[48] IPCC, 'Summary for policymakers' in CB Field et al (eds), *Climate Change 2014: Impacts, Adaptation and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the fifth assessment report of the IPCC* (Cambridge University Press, 2014) 1.3 ('IPCC summary for policymakers').

[49] Ibid; Potsdam Institute for Climate Impact Research and Climate Analytics, *Turn Down the Heat: why a 4°C warmer world must be avoided*, (Report for the World Bank's Global Expert Team for Climate Change Adaptation, 2012) 154.

[50] Steffen et al, above n 12, 116-7.

[51] Receding snowlines under warming temperatures will introduce new predators to already vulnerable alpine ecological communities, and ecosystems already under stress will be more susceptible to invasion by exotic species, eg IPCC AR5 Australasia, above n 45, 1391.

[52] Scheffers BR et al, 'The broad footprint of climate change from genes to biomes to people' (2016) 354(6313) *Science* 719; Dickinson Maria G et al, 'Separating sensitivity from exposure in assessing extinction risk from climate change' (2014) 4 *Scientific Reports* 6898.

[53] Morton SR et al, 'The big ecological questions inhibiting effective environmental management in Australia' (2009) 34(1) *Austral Ecology* 1, 4.

[54] IPCC AR5 Australasia, above n 45, 1375-6; Heller and Zavaleta, above n 25.

[55] Pacifici M et al, 'Assessing species vulnerability to climate change' (2015) 5 *Nature Climate Change* 215.

[56] Hooper DU et al, 'A global synthesis reveals biodiversity loss as a major driver of ecosystem change' (2012) 486(7401) *Nature* 105; Lindenmayer DB, 'Continental-level biodiversity collapse' (2015) 112(15)

Scientists have already observed the impacts of climate change on the genetic characteristics of species and populations and the structure of ecosystems, even in the context of the relatively mild climate change that has already occurred.[58] Other climate-driven changes have also been observed, include shifting species distributions,[59] and changes in behaviour and in the timing of seasonal flowering, pollination and migration events.[60]

Climate adaptation is 'the process of adjustment to actual or expected climate and its effects'.[61] Biodiversity adaptation has been described as '…the process of identifying strategies to prepare for or reduce the impacts of climate-related threats and stresses to biological systems'.[62] While all ecological systems have the capacity for some independent adaptation – including through redistribution;[63] behavioural or 'phenotypic' adaptation such as earlier or later migration, flowering or foraging seasons; or genetic adaptations[64] – the IPCC emphasises the important role that human intervention will play in facilitating adjustments in natural systems.[65] This is primarily because, despite the context of historical

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Proceedings of the National Academy of Science USA 4514; also affecting invertebrate and soil diversity, eg Pimentel D, 'Soil erosion: a food and environmental threat' (2006) 8(1) *Environment, Development and Sustainability* 119.

57 IPCC AR5 Australasia, above n 45, noting that vulnerability is particularly high in certain ecological systems such as the alpine zone, coastal wetlands, tropical savannahs, and biodiversity-rich regions such as southwest Western Australia, at 1391; Dunlop M et al, *Implications for policymakers: climate change, biodiversity conservation and the National Reserve System* (CSIRO Climate Adaptation Flagship, 2012) 4-5.

58 Eg Scheffers et al, above n 52; Parmesan C and G Yohe, 'A globally coherent fingerprint of climate change impacts across natural systems' (2003) 421 *Nature* 37; Rosenzweig C et al, 'Attributing physical and biological impacts to anthropogenic climate change' (2008) 453(7193) *Nature* 353.

59 Pecl GT et al, 'Biodiversity redistribution under climate change: impacts on ecosystems and human well-being' (2017) 355(6332) Science eaai9214-1.

60 Eg Parmesan and Yohe above n 58; Root Terry L et al, 'Fingerprints of global warming on wild animals and plants' (2003) 421 *Nature* 57; Colloran Brendan, Gretchen LeBuhn and Mark Reynolds, 'Pollinators and meadow restoration' in Root Terry L et al (eds) *Biodiversity in a changing climate: linking science and management in conservation* (University of California Press, 2015) 93.

61 Mach KJ, S Planton and C von Stechow (eds), 'Annex II: Glossary' in IPCC, *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the IPCC* (Cambridge University Press, 2014) ('IPCC AR5 Glossary'); *Climate Change Act 2017* (Vic), s 3.

62 Dubois N et al, *Integrating climate change vulnerability assessments into adaptation planning* (Report Prepared for the Florida Fish and Wildlife Conservation Commission, Defenders of Wildlife, 2011) 1.

63 Bonebrake, Timothy C et al, 'Managing consequences of climate-driven species redistribution requires integration of ecology, conservation and social science' (2017) 93(1) *Biological Reviews* 284, where the term 'species redistribution' is used 'to encapsulate not only species movement, but also its consequences for whole ecosystems and linked social systems'.

64 Hughes Lesley, 'Can Australian biodiversity adapt to climate change?' in Daniel Lunney and Pat Hutchings (eds), *Wildlife and climate change: towards robust conservation strategies for Australian fauna* (Royal Zoological Society of NSW, 2012) 8.

65 IPCC AR5 Glossary, above n 61, 1758.

climate variability in Australia, the pace and scale of anthropogenic climate change is projected to exceed the capacity of many species and ecosystems to independently shift their range fast enough or adapt their behaviour or genetics to survive.[66] The rate and scale of climate impacts on biodiversity will be compounded in Australia by the relatively flat and sparse landscape – limiting species' opportunities to find cooler habitats at higher altitudes.[67] 'Hard barriers' such as cities, roads and seas further limit cross-country migration to track climatic niches.

With growing numbers of threatened species, heavily fragmented environments, and some ecosystems on the verge of or in a state of collapse,[68] many species and systems are already close to the limits of their independent adaptive capacity. High levels of climate vulnerability and the complexity of ecological and climatic interactions will demand dynamic and responsive management tools and overarching approaches, and greater levels of 'human-mediated adaptation strategies' in future to minimise biodiversity loss and ecosystem collapse.[69] Human intervention to prepare for or reduce the impact of climate change on biodiversity will be a central theme in efforts to facilitate climate adaptation for biodiversity, including intervention through conservation laws and policies.[70]

However, even with ambitious adaptation-oriented conservation management, climate change will likely become a leading cause of biodiversity decline during this century. The

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[66] Steffen et al, above n 12, 94; Maggini R et al, *Protecting and restoring habitat to help Australia's threatened species adapt to climate change, final report* (National Climate Change Adaptation Research Facility, 2013); Hughes, above n 64, 9-10; Jezkova T and JJ Wiens, 'Rates of change in climatic niches in plant and animal populations are much slower than projected climate change' (2016) 283(1843) *Proceedings of the Royal Society B: Biological Sciences* 1; Cang, Wilson and Wiens, above n 44.
[67] Hughes, above n 64, 8, noting that on average, Australia's elevation is only 440 m, with approximately 13% of the continent >500 metres and only 0.01% >2000 metres; as the climate continues to change, species 'might be expected to [need to] shift at a rate of 3–17 km/year across the landscape, though far less in mountainous areas', Steffen et al, above n 12, 94.
[68] Including forest die-back as a result of reduced rainfall and water extraction in the Murray-Darling River Basin, intensified logging and recurring alpine fire in Mountain Ash forests in Victoria, eg Nimmo D et al, 'Great Barrier Reef bleaching is just one symptom of ecosystem collapse across Australia', *The Conversation* (3 May 2016) <https://theconversation.com/great-barrier-reef-bleaching-is-just-one-symptom-of-ecosystem-collapse-across-australia-58579>; Lindenmeyer DB et al, 'Environmental and human drivers influencing large old tree abundance in Australian wet forests' (2016) 372 *Forest Ecology and Management* 226; Mac Nally Ralph et al, 'Collapse of an avifauna: climate change appears to exacerbate habitat loss and degradation' (2009) 15(4) *Diversity and Distributions* 720; Mac Nally Ralph et al, 'Distribution of anuran amphibians in massively altered landscapes in south-eastern Australia: effects of climate change in an aridifying region' (2009) 18(5) *Global Ecology and Biogeography* 575.
[69] Hughes, above n 64, 10.
[70] Lorenzoni, I, WN Adger and KL O'Brien, *Adapting to climate change: thresholds, values, governance* (Cambridge University Press, 2009).

most recent United Nations Environment Programme ('UNEP') *Frontiers Report* highlighted the 'unavoidable' impacts of climate change on ecosystems as an issue of growing international environmental concern. The UNEP report found that climate mitigation activities will not be able to prevent some ecosystem losses and, in some cases, adaptation strategies will also be unable to manage ecosystem changes to avoid damage and prevent loss. It demonstrated that, for some climate change impacts at least, adaptation-oriented law and policy reform is already too late.[71]

Climate change is not just an issue for the future of biodiversity conservation. As already discussed, species are shifting their distribution, ecological interactions are changing, and sea level rise and storm surges have already directly caused extinctions, including of the Bramble Cay melomys.[72] Climate change is a challenge for biodiversity conservation *now*. This project provides the first detailed analysis of Australian laws and recommendations for reform to implement key biodiversity adaptation strategies.

1.3 The literature on adaptation-oriented conservation laws

This research demonstrates a lack of preparedness in Australian conservation laws to implement the key adaptation strategies listed above. In some cases, existing laws and policies may actively hinder conservation managers from anticipating and responding to the threats of climate change to species and ecosystems. Recognising that this mismatch between conservation laws and the need for adaptation could continue to grow, this thesis draws on three bodies of academic scholarship: conservation management under climate change, climate adaptation law and biodiversity conservation law. In turn, this research contributes to these three bodies of scholarship.

[71] United Nations Environment Programme, *Frontiers 2016 report: emerging issues of environmental concern* (2016) 44, noting that '[l]oss and damage become evident when adaptation measures are unsuccessful, insufficient, not implemented, or impossible to implement; or when adaption measures incur unrecoverable costs or turn out to be…maladaptations', at 45; Dow, K et al, 'Limits to adaptation' (2013) 3(4) *Nature Climate Change* 30; Huq, S, E Roberts and A Fenton, 'Loss and damage' (2013) 3(11) *Nature Climate Change* 947; Zhu, Kai, Christopher W Woodall and James S Clark, 'Failure to migrate: lack of tree range expansion in response to climate change' (2012) 18(3) *Global Change Biology* 1042; Roberts, E et al, 'Loss and damage: when adaptation is not enough' (2014) 11 *Climate Change / Environmental Development* 219.

[72] Gynther, Waller and Leung, above n 3; Pounds JA, MLP Fogden and JH Campbell, 'Biological response to climate change on a tropical mountain' (1999) 398 *Nature* 611; IPCC AR5 Australasia, above n 45, 1390-1.

Climate adaptation is no longer a 'poor cousin' to mitigation research in climate change academic, legal and policy agendas.[73] Climate adaptation scholarship is growing rapidly in a wide variety of disciplines, including biological and ecological sciences, political science, geography, human development, and human rights.[74] It is also prominent across specialist legal areas such as planning and development law, corporate regulation and insurance and human health and natural disaster laws.[75] Legal research on climate adaptation for biodiversity continues to hold a less prominent position when compared with legal issues for human adaptation under climate change.[76] Nevertheless, insights from existing climate adaptation legal research have been used throughout the thesis, particularly for designing and implementing laws that can themselves evolve over time in the context of rapid and ongoing change.

Biodiversity management is the subject of a large body of conservation science scholarship. Within this field of research, there has been a recent, rapid increase in scientific research on management strategies to support biodiversity adaption as the climate changes.[77] Conservation sciences such as evolutionary biology, conservation ecology, and the emerging discipline of species redistribution ecology,[78] offer particularly important perspectives for this thesis on both climate adaptation challenges and potential biodiversity management responses. These bodies of scholarship fundamentally underpin this research because the key adaptation strategies, identified in conservation literature,

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[73] Pielke, Roger et al, 'Climate change 2007: lifting the taboo on adaptation' (2007) 445(7128) *Nature* 597, 597; in light of the *United Nations Framework Convention on Climate Change*, opened for signature 9 May 1992, 1771 UNTS 107 (Entered into force 21 March 1994) and its obligation to formulate and implement '…measures to facilitate adequate adaptation to climate change'; UNFCCC Conference of the Parties, *Decision 1/CP.13: Bali Action Plan, Report of the Conference of the Parties on Its Thirteenth Session: Addendum, T* 1(c)-(e), U.N. Doc. FCCC/CP/2007/6/Add.1 (14 March 2008).

[74] Eg Webber, Sophie, 'Climate change adaptation as a growing development priority: towards critical adaptation scholarship' (2016) 10(10) *Geography Compass* 401; Doherty Meghan, Kelly Klima and Jessica J Hellmann, 'Climate change in the urban environment: advancing, measuring and achieving resiliency' (2016) 66 *Environmental Science & Policy* 310; Australian Human Rights Commission, *Human Rights and Climate Change Background Paper* (2008) <https://www.humanrights.gov.au/papers-human-rights-and-climate-change-background-paper>, and references cited therein; and IPCC summary for policymakers, above n 48, now including a specific focus on observed adaptation and adaptive capacity.

[75] Including the references cited above, n 23.

[76] Ibid; Glick, Patty, Helen Chmura and Bruce A Stein, *Moving the conservation goalposts: a review of climate change adaptation literature* (US National Wildlife Federation and National Council for Science and the Environment, 2011) 4.

[77] Reflected in the research syntheses by Heller and Zavaleta, above n 25; Mawdsley, O'Malley and Ojima, above n 25; Glick, Chmura and Stein, above n 76.

[78] Bonebrake et al, above n 63.

have been used to guide the structure of the thesis and influence how the research findings are reported in later chapters.[79]

In addition to climate adaptation law and conservation management scholarship, this research draws on environmental law reform developments. In particular, recent research has proposed the need for a 'new generation' of environmental law and governance.[80] Existing environmental laws have failed to eliminate species extinctions and prevent ecological processes from being compromised or lost, in Australia and elsewhere.[81] Criticisms of environmental laws include poor implementation and an ongoing failure to enforce environmental objectives, especially when they are in competition with economic and development objectives.[82] Research on new forms of legal and regulatory design, particularly anticipating the implications of climate change for regulatory regimes, have influenced the recommendations in this thesis.

A comparatively small body of research, particularly coming out of the United States, sits at the intersection of these three fields.[83] It investigates aspects of adaptation-oriented conservation laws. This literature initially focused on specific natural resource sectors[84] or individual legal tools such as adaptive management.[85] More recently, the literature has expanded to include overarching principles for climate adaptation across conservation

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[79] Section 15 details the thesis structure.
[80] Eg Australian Panel of Experts in Environmental Law ('APEEL'), *A new generation of environmental laws* (Preliminary report of the APEEL, 2017) <http://apeel.org.au/>; Gunningham and Holley, above n 33.
[81] Woinarski, John CZ et al, 'The contribution of policy, law, management, research, and advocacy failings to the recent extinctions of 3 Australian vertebrate species' (2016) 31(1) *Conservation Biology* 13; Bradshaw, above n 40.
[82] Eg Australian Conservation Foundation, Birdlife Australia and Environmental Justice Australia, *Recovery planning: restoring life to our threatened species* (Birdlife Australia, 2015); Frank, Eyal G and Wolfram Schlenker, 'Balancing economic and ecological goals' (2016) 353(6300) *Science* 651.
[83] Eg Ruhl, above n 33; Craig, Robin K, '"Stationarity is dead" - long live transformation: five principles for climate change adaptation law' (2010) 34(1) *Harvard Environmental Law Review* 9; see also Trouwborst, Arie, 'International nature conservation law and the adaptation of biodiversity to climate change: a mismatch?' (2009) 21(3) *Journal of Environmental Law* 419.
[84] Eg Jantarasami, LC, JJ Lawler and CW Thomas, 'Institutional barriers to climate change adaptation in U.S. national parks and forests' (2010) 15(4) *Ecology and Society* 33, 34; Cosens, Barbara A and Mark Kevin Williams, 'Resilience and water governance: adaptive governance in the Columbia River Basin' (2012) 17(4) *Ecology and Society* 3; Glicksman, RL, 'Ecosystem resilience to disruptions linked to global climate change: an adaptive approach to federal land management' (2009) 87 *Nebraska Law Review* 833; Griffith, B et al, 'Climate change adaptation for the US National Wildlife Refuge System' (2009) 44(6) *Environmental Management* 1043.
[85] Eg Camacho, Alejandro E, 'Can regulation evolve? Lessons from a study in maladaptive management' (2007) 55 *UCLA Law Review* 293; Biber, Eric, 'Adaptive management and the future of environmental law' (2013) 46(4) *Akron Law Review* 933; McDonald, Jan and Megan C Styles, 'Legal strategies for adaptive management under climate change' (2014) 26(1) *Journal of Environmental Law* 25.

sectors and institutions.[86] This thesis contributes primarily to this literature, drawing connections between design challenges for climate adaptation law, adaptation strategies for biodiversity conservation as the climate changes, and general principles for environmental law reform.

1.4 Thesis structure

This thesis answers the research questions in three distinct stages, as set out in Figure 1.1. This section outlines how these three thesis stages contribute to answering the research questions.

Part 1 establishes the research context for this research. Chapter 2 introduces the research paradigm, methodology and research methods that have been adopted for this research. It argues that law and policy, including for biodiversity conservation, form part of an often messy framework of institutions, communities and individuals.[87] This research uses both qualitative and legal doctrinal research methods, taking a 'socio-legal' approach to addressing the broad research objectives. Qualitative research is used to supplement doctrinal approaches, providing a useful means to explore the varied experiences of key stakeholders, including of the practical operation of conservation law and policy.[88]

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[86] Eg Craig, Robin Kundis et al, 'Balancing stability and flexibility in adaptive governance: an analysis of tools available in U.S. environmental law' (2017) 22(2) *Ecology and Society* 3; Camacho Alejandro E, 'Transforming the means and ends of natural resources management' (2011) 89 *North Carolina Law Review* 1405; Arnold, Craig Anthony (Tony) and Lance H Gunderson, 'Adaptive law' in Garmestani Ahjond S and Craig R Allen (eds), *Social-ecological resilience and law* (Columbia University Press, 2014).
[87] This 'mess' includes political, social and cultural assumptions evident in social research but often ignored in traditional legal research approaches, see generally Law J, 'After method: an introduction', in Law J (ed) *After method: mess in social science research* (Routledge, 2004) 1.
[88] Merriam S, 'Introduction to Qualitative Research' in Merriam S (ed) *Qualitative research in practice: examples for discussion and analysis* (Jossey-Bass, 1st ed, 2002) 3.

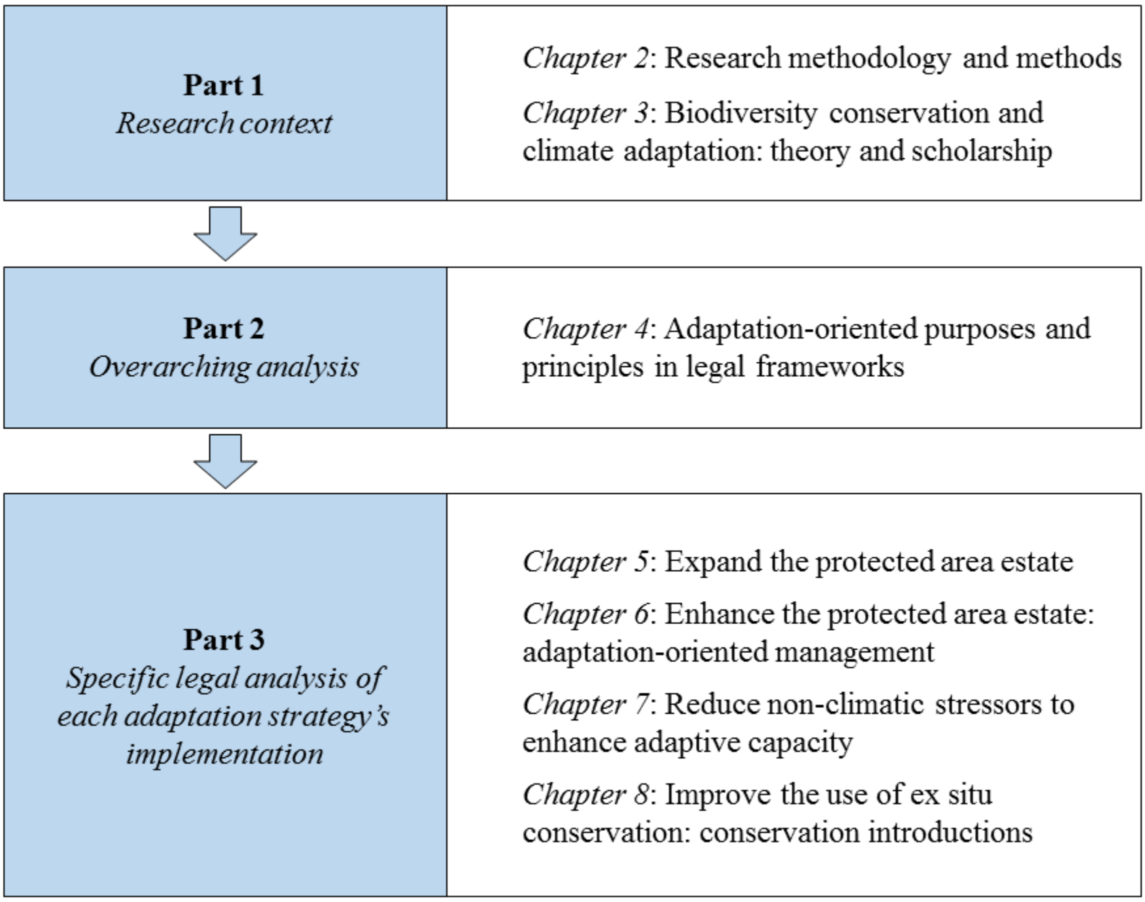

Figure 1.1 Structure of the thesis, identifying how each chapter contributes to answering the research questions

Having identified the adaptation strategies that frame the remainder of the thesis, Chapter 3 synthesises the scientific scholarship on biodiversity conservation and adaptation, and recommendations in the literature for each of the adaptation strategies. Chapter 3 highlights the most important characteristics of each adaptation strategy, and underpins the detailed, legal analyses in Part 3.

Part 2 ‘steps back’ from the conservation literature to assess the general capacity of legal frameworks for conservation to facilitate climate adaptation. Chapter 4, the only chapter in Part 2, establishes the legal context for the remainder of the thesis in two distinct ways. First, it provides a broad perspective on the ‘climate-readiness’ of legal frameworks for conservation in Australia. It investigates the expression of conservation goals in law, as a prerequisite for effective implementation of the adaptation strategies. It analyses direct legal priorities expressed in objects clauses, and indirect priorities expressed in regulations, guidelines, funding and practice. The results of this analysis reveal what is, perhaps, the most challenging issue for reorienting conservation laws to promote adaptation: a fundamental question about what the law currently does – and what it should in future – seek to achieve through conservation law and practice. Legal objects clauses are intended to represent what society actually values from biodiversity but the answer to the question of 'what is valued', is far from certain under current conditions, let alone in a context of rapid environmental change.[89] Chapter 4 proposes new ways of thinking about these goals, and of expressing adaptation-oriented goals in conservation laws.

The second 'contextual' role played by Chapter 4 is to develop a series of three legal design principles. These principles advocate laws that: (1) embody proactive conservation approaches; (2) improve legal flexibility without reducing accountability; and (3) prioritise adaptive management for biodiversity conservation. These three design principles are used to frame a doctrinal analysis of the laws and policies that implement the adaptation strategies. They are also used in this thesis to inform recommendations for legal reform, to enhance the representation and adaptation-orientation of conservation laws for each climate adaptation strategy.

Part 3 is made up of thesis Chapters 5 to 8, which consider each of the key strategies for facilitating biodiversity adaptation under climate change.[90] The adaptation strategies are to:

- increase the number, size and diversity of protected areas and enhance protected area networks to improve representation, replication and resilience ('protected area strategy');

- protect movement corridors, stepping stones and refugia, and create and manage buffer zones around reserves; and improve the matrix by increasing broader landscape connectivity and landscape permeability to species movement ('connectivity strategy');

[89] Eg is it particular species, ecological communities or ecosystems, or aesthetics, familiarity, economic values, spirituality, or – more likely – a complex and fluid combination of these? For more on this challenge, see Dunlop Michael et al, 'Climate-ready conservation objectives: a scoping study' (National Climate Change Adaptation Research Facility, 2013).
[90] As identified in two meta-reviews of published conservation science, Heller and Zavaleta, above n 25, which reviewed 22 years of international adaptation literature to identify and rank biodiversity conservation strategies for climate adaptation; Mawdsley, O'Malley and Ojima, above n 25, which reviewed literature and adaptation planning developed in the US, England, Mexico, Canada and South Africa.

- reduce stressors and threats to biodiversity from sources other than climate change, both within and beyond protected areas ('non-climatic stressors strategy');
- translocating organisms[91] at risk of extinction (together with the next strategy, '*ex situ* strategy'); and
- engage more proactively with *ex situ* conservation, including by establishing captive breeding programs and captive populations of species that would otherwise become extinct (together with the strategy above, '*ex situ* strategy').[92]

Part 3 presents a substantive analysis of the implementation of each of these adaptation strategies in Australian law. The protected area strategy is the subject of two chapters because the legal framework for increasing the protected area estate is quite distinct – in law and practice – from the process of enhancing the adaptive capacity of existing protected areas through their management and the use and management of neighbouring land. These two components of the protected area strategy are analysed separately in Chapters 5 and 6, respectively.

Chapter 7 investigates the adaptation strategy of reducing or removing the effect of non-climatic stressors on biodiversity, to maximise ecological resilience and adaptive capacity. Legal frameworks for addressing non-climatic stressors include weed and pest animal strategies and legislative controls; biosecurity and quarantine arrangements; native vegetation clearing controls; and threat abatement listing and planning tools. Chapter 7 focuses on laws and policies for land clearing and invasive species, which are the two most significant non-climatic stressors for Australian biodiversity.

The *ex situ* strategy covers a range of conservation approaches, from supplementing species populations with genetically diverse individuals to increase the population's

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[91] The term 'organism' is defined as 'a species, subspecies or lower taxon, and includes any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce', International Union for the Conservation of Nature ('IUCN')/Species Survival Commission, *Guidelines for reintroductions and other conservation translocations: version 1.0* (IUCN, 2013) ('IUCN Guidelines 2013') 1.
[92] Heller and Zavaleta, above n 25, 25; Mawdsley, O'Malley and Ojima, above n 25, 1087; scientific scholarship often separates the second strategy into two, distinguishing movement corridors and stepping stones from improving matrix permeability but, given the similarities in the applicable law and policy, these have been combined in this research in the connectivity strategy.

adaptive capacity through to preserving species populations in zoological and botanical gardens, aquaria, and their genetic material in seed and gene banks. Given the breadth of legal issues that arise in these very different conservation contexts, Chapter 8 focuses specifically on conservation introductions. Conservation introductions involve introducing an organism, such as a species, population or ecological community, outside of the area in which it is defined as native (its 'historical distribution'), for a conservation purpose.[93] Conservation introductions are both an *ex situ* form of translocation,[94] and a particularly controversial but increasingly important strategy for adaptation.[95]

Analysis of the connectivity strategy is integrated into each of Chapters 5 to 8. This approach highlights overlaps in the laws, policies and theoretical and practical challenges to implement the connectivity strategy and each of the other adaptation strategies.[96] Chapter 9 then concludes this thesis, summarising the results for each of the research questions and demonstrating the substantial and novel contribution that this thesis makes to the climate adaptation and biodiversity conservation legal scholarship.

This thesis does not argue that each strategy will promote biodiversity adaptation effectively in every context. Some of these strategies remain deeply contested, particularly introducing species and ecological assemblages outside their native range.[97] However, the adaptation strategies present useful and well-recognised examples of adaptation-oriented interventions for biodiversity which have been recommended for implementation and, by implication, for promotion through legal frameworks. The adaptation strategies are a useful frame for analysing the way that conservation law can promote biodiversity adaptation because they are diverse, ranging from relatively low-cost and low-information-needs strategies, such as increasing and enhancing the protected area estate, through to high-cost,

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[93] IUCN Guidelines 2013, above n 91, viii.
[94] And therefore relevant to both the fourth and fifth adaptation strategies.
[95] Further justification of this decision is set out in Chapter 3, Section 3.3.4.
[96] For a detailed justification of this approach, see Chapter 2, Section 2.4.1.
[97] Eg Ricciardi, A and D Simberloff, 'Assisted colonization is not a viable conservation strategy' (2009) 24(5) *Trends Ecol Evol* 248; and see Haddad, Nick M et al, 'Potential negative ecological effects of corridors' (2014) 28(5) *Conserv Biol* 1178.

high-intervention and species- or even population-specific strategies such as managed relocation.[98]

Finally, climate change is not the only, nor currently the most significant, threat for many species, ecological communities and ecosystems in Australia.[99] Challenges for biodiversity other than climate change have been the subject of substantial research interest, and include a lack of political will,[100] insufficient conservation funding,[101] and human consumption and population trends.[102] This thesis argues that alongside responses to existing environmental challenges, Australian laws must also prepare for the future. In particular, conservation laws must facilitate adaptation in parallel with laws to address existing threats, to minimise the catastrophic biodiversity losses that would otherwise be inevitable. As climate change increases in pace, scale and interaction with other biodiversity stressors, current conservation efforts will be wasted unless concerted, ambitious management interventions can also facilitate biodiversity adaptation.[103]

[98] Chapter 3, Figure 3.1.
[99] Steffen et al, above n 12; SotE 2016, above n 11.
[100] Debus, B, 'All living things are diminished: breaking the national consensus on the environment' (The Whitlam Institute, University of Western Sydney, 2014); Measham, Thomas G et al, 'Adapting to climate change through local municipal planning: barriers and challenges' (2011) 16(8) *Mitigation and Adaptation Strategies for Global Change* 889; Dovers Stephen R and Adnan A Hezri, 'Institutions and policy processes: the means to the ends of adaptation' (2010) 1(2) *Wiley Interdisciplinary Reviews: Climate Change* 212.
[101] Waldron, above n 16; Watson, JE et al, 'The performance and potential of protected areas' (2014) 515(7525) *Nature* 67.
[102] Eg Butchart, above n 10; Holdren, JP and PR Ehrlich, 'Human population and the global environment' (1974) 62 *Am. Sci.* 282; Cincotta, RP, J Wisnewski and R Engelman, 'Human population in the biodiversity hotspots' (2000) 404 *Nature* 990.
[103] Eg Steffen, W et al, 'Sustainability and planetary boundaries: guiding human development on a changing planet' (2015) 347(6223) *Science* 125985.

Chapter 2 Methodology and methods

2.1. Introduction

The preceding chapter introduced this thesis and the primary and subsidiary research questions that will be addressed in the substantive chapters that follow. Before moving on to answer those research questions, this chapter explains and justifies the research framework that has been adopted and the methodological decisions that underpin the research. It demonstrates that they are appropriate for the task of answering the main and subsidiary research questions.

There is a reflexive relationship between a research methodology and the research questions being investigated. As Elizabeth Fisher and colleagues have noted, 'recognising and scrutinising this relationship is an important first step to methodological and scholarly rigour'.[1] To that end, Section 2.2 describes the overarching 'critical realism' paradigm, or framework, adopted in this research. Critical realism provides a useful framework for qualitative legal research in general, and is particularly well-suited to answering the legal and social research questions investigated here. Section 2.3 introduces the mixed socio-legal methodology and its connection with the thesis research methods. Section 2.4 details those mixed research methods, which include: a focus on the four key biodiversity adaptation strategies, as foreshadowed in the introductory chapter; doctrinal analysis of Australian conservation legal frameworks; key informant interviews; and a thematic approach to data analysis. Each of these research methods contributes to answering the research questions and developing recommendations for enhancing climate adaptation through conservation legal frameworks in Australia. This chapter concludes with a summary of how the research methods are used throughout the remainder of this thesis to answer the research questions.

2.2. Critical realism – a research framework

The research framework adopted in this research provides a lens through which all decisions about research methodology and methods have been made. This thesis does not

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[1] Fisher, Elizabeth et al, 'Maturity and methodology: starting a debate about environmental law scholarship' (2009) 21(2) *Journal of Environmental Law* 213, 227, 244.

adopt a traditional legal positivism framework, which would prioritise objective, deductive, and 'black-letter law' doctrinal research. Nor is this research underpinned by interpretivism, which prioritises subjective, non-doctrinal, inductive, social research.[2] Rather, both doctrinal and non-doctrinal, and deductive and inductive approaches, are employed in complementary ways to critically evaluate conservation legal frameworks in Australia. The research questions in this thesis support an investigation of both 'what is in the law' and questions 'about the law' as it operates in practice and for the purposes of reform.[3] As a result, the underpinning research framework that has been adopted is 'critical realism' – a centrist research paradigm that is ideal for socio-legal research and the particular research questions.[4]

Critical realism is a philosophical research framework that is based on a realist ontology, that is, it adopts a realist perspective in seeking to understand and explain 'the *nature* and *structure* of "reality"'.[5] Critical realism sees the 'real world' as existing apart from what is socially constructed.[6] A realist ontology can accommodate doctrinal research as a process of identifying the features of that 'real world'. That process includes identifying real world features such as whether and how adaptation strategies are currently found in Australian conservation laws (research question ('RQ') III), and the way in which existing legal frameworks create barriers to, and opportunities for, climate adaptation (RQIV).

Critical realism supplements its realist ontology with an interpretivist epistemology. That is, in considering 'what can be known about the world', critical realism acknowledges that knowledge and understanding are interpretive processes, with people playing fundamental and complex roles in reproducing and transforming the social world around them.[7] The interpretivist epistemology provides an important perspective on the answer to RQV –

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[2] McKerchar, Margaret, *Design and conduct of research in tax, law and accounting* (Thomson Reuters, 2010) 78; Chynoweth, Paul, 'Legal research' in Andrew Knight and Les Ruddock (eds) *Advanced research methods in the built environment* (2008) 28, 29.
[3] McKerchar, above n 2, 78.
[4] Ibid 77-78; also sometimes described as 'postpositivism', Perry, Stephen, 'Beyond the distinction between positivism and non-positivism' (2009) 22(3) *Ratio Juris* 311.
[5] Guarino, Nicola, Daniel Oberle and Steffen Staab, 'What is an Ontology?' in Steffen Staab and Rudi Studer (eds), *Handbook on Ontologies* (Springer, 2009) 1, 1, emphasis in original; Grix, Jonathan, *The foundations of research* (Palgrave McMillan, 2004) 85-6.
[6] Grix, above n 5, 84-87.
[7] Fleetwood, Steve, 'Ontology in organization and management studies: a critical realist perspective' (2005) 12(2) *Organization* 197, 207; Centre for Critical Realism, 'About critical realism' <https://centreforcriticalrealism.com/about-critical-realism/basic-critical-realism/>.

How can Australian law be reformed to improve the representation and implementation of these strategies? – recognising that the way that conservation legal frameworks are interpreted and applied is just as important for enhancing climate adaptation outcomes as the written form of the legal instruments.

Critical realism defines laws and policies as *socially real* – as entities that have no material form; that depend on human activity for their existence; and that require human identification to be reproduced or transformed, 'because individuals have to recognize them and choose to be constrained (and enabled) by them'.[8] This philosophical framework aligns closely with the orientation and goals of this research. In particular, it supports an investigation of the key research question about current laws and policies, and opportunities for law reform 'in the real world'. Most importantly, critical realism provides a framework through which to draw on the scholarship of two realist traditions, the disciplines of science and law, while recognising that the complexity of social engagement and interactions with conservation legal frameworks is a central consideration in developing recommendations for effective, adaptation-oriented law reform.

Critical realism also provides a particularly effective philosophical framework for this project, and its research methodology and methods, because it is based on an understanding that social structures continuously change over time[9] including, for the purposes of this research, the natural environment and human engagement with its conservation. Critical realists recognise that there is no 'beginning' or natural starting point for an investigation, accepting that a researcher necessarily comes to investigate social processes at some point in ongoing cycles of transformation.[10] Change is a fundamental component of social and ecological structures and interactions, and this thesis draws on critical realism to inform a research design that acknowledges ongoing transition, and the potential to direct transformation in legal frameworks to more desirable rather than less desirable forms in the face of rapid climate change.

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[8] Distinguished from other 'modes of reality' such as *materially real* (chairs, books), *ideally real* (ideas, theories, discourse) and *artefactually real* (a combination of materially, ideally and socially real entities, eg cosmetics), Fleetwood, above n 7, 202.
[9] Fleetwood, above n 7, 202-3.
[10] Ibid 203.

2.3. A mixed, qualitative/legal research methodology

This section describes the ‘mixed’ socio-legal methodology adopted in this thesis;[11] the way that it is influenced by principles of critical realism; and how this methodology informs the mixed research method approach set out in Section 2.4. The evolution of qualitative legal research methodologies, and the obligation to articulate a legal research methodology, are both relatively new phenomena in legal research.[12] Environmental law, in particular, lacks a coherent, unifying methodology, which contributes to what some have described as an ‘immaturity’ in environmental legal scholarship.[13] Socio-legal approaches – combining qualitative and legal research methodologies and methods – are developing to address this historical weakness in legal research design.[14]

Socio-legal methodology regards the law, and particularly its operation and effects, as valuable subjects of research.[15] Socio-legal methodologies may be appropriately applied to environmental law research because the social context, including for conservation interventions, is clearly critical for effective implementation and reform.[16] It supports a dual focus on legal instruments and actual social practices, accommodating normative and empirical investigation – such as the combination of doctrinal analysis, key informant interviews and thematic analysis, described below – to support a critical analysis of the legal framework and ‘focus on relationships ignored in conventional legal analysis and also aid in understanding the law’.[17]

The socio-legal research methodology adopted in this thesis supports the combination of doctrinal research questions about what the law says, and social research questions about

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[11] Drawing on the ‘mixed methodology’ concept described in McKercher, above n 2, 118-120.
[12] See Fisher et al, above n 1, 228-230; Murphy, Brendon and Jeffrey McGee, ‘Phronetic legal inquiry: an effective design for law and society research?’ (2015) 24(2) *Griffith Law Review* 288; Chynoweth, above n 2, 28.
[13] Fisher et al, above n 1, 218, 227.
[14] Eg Martin and Gunningham have argued for a new methodological approach to environmental law research that harnesses connections between legal issues and other disciplinary perspectives, proposing 10 principles to establish a ‘robust environmental governance framework’ that focuses on legal architecture as well as doctrinal improvements, Martin, Paul and Neil Gunningham, ‘Leading reform of natural resource management law: core principles’ (2011) 28(3) *Environmental and Planning Law Journal* 137.
[15] See generally, Centre for Socio-Legal Studies, University of Oxford, Faculty of Law <https://www.law.ox.ac.uk/centres-institutes/centre-socio-legal-studies>.
[16] Bull, JW et al, ‘Creating a frame of reference for conservation interventions (2015) 49 *Land Use Policy* 273.
[17] Fisher et al, above n 1, 244-5.

what that means and how it can and should be improved. In particular, a combined qualitative and legal methodology, drawing on the realism/interpretivism combination of the critical realism framework; supports an investigation of whether existing, written forms of law support adaptation-oriented biodiversity management; and whether the law's application in policy, practice and perception, exhibits greater adaptation potential than the written law would suggest. Reform-oriented questions about 'what the law *should* say' and 'how the law *should* be applied' draw particularly on the qualitative aspects of this research methodology.[18]

The combination of a realist ontology and interpretivist epistemology of critical realism underpins this mixed methodology and accommodates both legal and social research questions. The combination of legal and social research questions cannot be investigated using a single research method. The mixed research methodology adopted in this thesis demands the use of multiple research methods – legal doctrinal analysis to understand the content and status of existing legal instruments, and social research methods such as key informant interviews, to support a detailed investigation of the practical operation of those instruments in their social context, along with opportunities for reform.

2.4. Mixed methods research

This research employed a combination of research methods to generate rich data about the written form and practical application of conservation laws for climate adaptation. This section describes the way that the research methods are framed by a 'nested', cross-jurisdictional approach to gathering and analysing research data. In keeping with the critical realism framework and socio-legal methodology, this thesis uses both legal doctrinal analysis and qualitative, semi-structured interviews to generate primary data. This section also defines the deductive and inductive approaches taken to analysing those data, explaining how the data analyses align with the broader research approach. The research methods and approaches discussed below have each been selected because they provide different, and complementary, sources of data to support a detailed analysis of each of the focal adaptation strategies.

[18] Ibid.

2.4.1. Focal adaptation strategies

As discussed in Chapter 1, the five most commonly recommended strategies for biodiversity adaptation as the climate changes are: (1) increasing and enhancing the protected area estate ('protected area strategy'); (2) improving landscape connectivity ('connectivity strategy'); (3) reducing non-climatic stressors ('non-climatic stressor strategy'); and (4) translocating organisms at risk of extinction and (5) engaging proactively with *ex situ* conservation.[19] The fourth and fifth strategies are combined in this thesis as the '*ex situ* strategy'.

The key characteristics of each of these adaptation strategies were identified using a systematic review of peer-reviewed literature published since 2009. The systematic literature review involved searches using the Web of Science portal, which covers multiple ecological and conservation management databases. Broader searches to identify additional papers were then conducted using key word searches in Google Scholar, and reference lists from existing literature reviews.[20] Relevant grey literature was identified through searches on Australian biodiversity conservation and adaptation government and research institution websites, including the National Climate Change Adaptation Research Facility ('NCCARF'), the Commonwealth environment department and other Commonwealth government bodies, state and territory government department websites and NRM regional bodies. These searches were conducted through www.australia.gov.au, and Google searches for 'biodiversity' and 'conservation' that were limited by the search term 'site:.gov.au'.

Critical realism recognises that the 'real world' can be investigated through in-depth and detailed research, but only understood in its rich and detailed context.[21] As such, a detailed investigation of each of the adaptation strategies is particularly well-suited to the critical realist research framework. Similarly, using the adaptation strategies in this way aligns

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[19] Chapter 1, Section 1.4.
[20] Heller, Nicole E and Erika S Zavaleta, 'Biodiversity management in the face of climate change: A review of 22 years of recommendations' (2009) 142(1) *Biological Conservation* 14; Mawdsley, JR, R O'Malley and DS Ojima, 'A review of climate-change adaptation strategies for wildlife management and biodiversity conservation' (2009) 23(5) *Conservation Biology* 1080.
[21] Easton, Geoff, 'Critical realism in case study research' (2010) 39(1) *Industrial Marketing Management* 118, 119.

with the socio-legal methodology adopted in this thesis because it allows multiple sources of evidence and multiple research methods to be integrated,[22] generating data that crosses the boundary between the law 'as it is written' and socio-legal considerations of how the law is understood and implemented at any given time.[23]

As noted in Chapter 1, the connectivity strategy is considered as a component of each of Chapters 5 to 8.[24] The connectivity strategy is integrated across those chapters because legal mechanisms for promoting landscape-scale conservation and ecological connectivity arise in a diverse range of legal instruments, including legislation for river flows and tax incentive schemes for agricultural practices.[25] However, they are most commonly found in land use planning and protected area laws and policies, intersecting neatly with the discussion about protected areas in Chapters 5 and 6. There is, however, growing recognition that addressing non-climatic stressors for biodiversity must be planned and implemented at both landscape and local scales and across borders; so the connectivity strategy has a place in the discussion about non-climatic stressors in Chapter 7.[26] Finally, adaptation-oriented connectivity can support *ex situ* conservation through existing governance frameworks, and enhancing ecological health and functioning is the specific goal of some conservation introductions, which are the subject of Chapter 8.[27]

Integrating discussion of the connectivity strategy in this way illustrates one of the overarching recommendations of this research, which is that improving the adaptiveness of legal frameworks and making them more adaptation-oriented in respect of the other adaptation strategies can also facilitate healthier and more permeable landscapes for biodiversity adaptation. Integrating the connectivity strategy in this way also highlights

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[22] Such as legal doctrinal analysis and interviews, see Easton, Geoff, 'Case research as a method for industrial networks: a realist apologia' in Stephen Ackroyd and Steve Fleetwood (eds) *Realist perspectives on management and organisations* (Routledge, 2000) 205, 211.

[23] McKercher, above n 2, 101-112; and incorporating the driving energies of research participants, Macpherson, Ian, Ross Brooker and Paul Ainsworth, 'Case study in the contemporary world of research: Using notions of purpose, place, process and product to develop some principles for practice' (2000) 3(1) *International Journal of Social Research Methodology* 49, 51.

[24] Section 1.4.

[25] Lausche, Barbara et al, *The legal aspects of connectivity conservation: a concept paper* (International Union for the Conservation of Nature, 2013).

[26] Eg ecological connectivity can reduce stressors such as land clearing, but may also exacerbate stressors such as invasive species by facilitating their migration.

[27] McCormack, Phillipa C, 'Conservation introductions for biodiversity adaptation under climate change' (2018) (first view) *Transnational Environmental Law* 1.

similarities between the risks and uncertainties of the connectivity and conservation introduction strategies[28] – with the potential for legal and policy reform to improve the implementation of both; and opportunities to reduce the risks of enhanced landscape connectivity by supplementing the connectivity strategy with lower-risk adaptation strategies, such as increasing protected areas and reducing non-climatic stressors.[29]

The adaptiveness of laws for conserving threatened species and their habitat was not the subject of detailed analysis in this thesis. This omission is particularly unusual for a conservation law thesis. However, the omission was purposeful. While threatened species and critical habitat protections are a fundamental component of *existing* conservation laws, literature on biodiversity management for adaptation typically proposes a broader perspective that replaces species-specific approaches, or at least supplements them, with a focus on ecosystems, landscapes and ecological interactions and processes.[30] Importantly, for the research framework described in this chapter, none of the adaptation strategies deals specifically with threatened species laws, so those laws did not have a natural place in this thesis.[31]

2.4.2. 'Nested' analysis of legal frameworks at multiple governance scales

Conservation laws operate across all governance scales in Australia, leading to complexity and regulatory fragmentation but also offering a broad range of contexts for application and opportunities for learning and reform.[32] To capture this complexity and the overlaps

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[28] Including the potential for adverse outcomes as a result of more rapid movement of invasive species, pathogens and wildfire, Prober, Suzanne M and Michael Dunlop, 'Climate change: a cause for new biodiversity conservation objectives but let's not throw the baby out with the bathwater' (2011) 12(1) *Ecological Management & Restoration* 2, 3; Lawler, Joshua J and Julian D Olden, 'Reframing the debate over assisted colonization' (2011) 9(10) *Frontiers in Ecology and the Environment* 569.
[29] Lunt, Ian et al, 'Using assisted colonisation to conserve biodiversity and restore ecosystem function under climate change' (2013) 157 *Biological Conservation* 172; Hodgson, Jenny A et al, 'Climate change, connectivity and conservation decision making: back to basics' (2009) 46(5) *Journal of Applied Ecology* 964.
[30] Eg Mawdsley et al, above n 6; Heller & Zavaleta, above n 6.
[31] There are, however, examples of research dealing specific with these challenges for threatened species laws, eg Australian Network of Environmental Defender's Offices Inc (ANEDO), *Assessment of the adequacy of threatened species & planning laws* (Updated report by Places You Love Alliance and ANEDO, 2014); Australian Conservation Foundation, Birdlife Australia and Environmental Justice Australia, *Recovery planning: restoring life to our threatened species* (Birdlife Australia, 2015).
[32] See eg Clement, S, SA Moore and M Lockwood, 'Authority, responsibility and process in Australian biodiversity policy' (2015) 32 *Environmental and Planning Law Journal* 93; potential benefits of regulatory fragmentation for climate adaptation may include promoting synergy between governance scales, informal

and gaps in legal frameworks for biodiversity adaptation, this thesis adopts a multi-scale research approach. That is, the doctrinal analysis for each adaptation strategy was conducted on conservation laws and policies at national, state, regional and local government scales. Interview participants were also selected from a combination of government, academia, natural resource management, and consulting and advocacy organisations across these scales.[33]

Given that a comprehensive analysis of every governance scale in every Australian jurisdiction was well beyond the scope of this thesis,[34] a 'nested' approach was adopted, focusing on the Commonwealth; Tasmania and Victoria at the state scale; one regional jurisdiction in each of those two states – Natural Resource Management ('NRM') South in Tasmania and the North East Catchment Management Authority ('NECMA') in Victoria; and one local government area in each of those regions, Kingborough City Council in the NRM South region and City of Wodonga local government area in the NECMA region (Figure 2.1).

networks for improved information flows and collaboration, and contexts for experiments and comparison, Ruhl JB, 'General design principles for resilience and adaptive capacity in legal systems - with applications to climate change adaptation' (2011) 89 *North Carolina Law Review* 1373, 1396-7.

[33] Only government 'key informants' were interviewed at regional and local scales, although national and state interviews non-government key informants – including consultants, advocates and academics – provided additional data on the application of conservation laws at regional and local scales, see Figure 2.2, below.

[34] In addition to the Commonwealth and eight state and territory governments, there are approximately 56 regional bodies and 560 local governments responsible for implementing different components of legal frameworks for conservation around Australia; Australian Government, 'Regional NRM organisations' <http://www.nrm.gov.au/regional/regional-nrm-organisations> and Australian Local Government Association ('ALGA'), 'About ALGA' <http://alga.asn.au/?ID=42>.

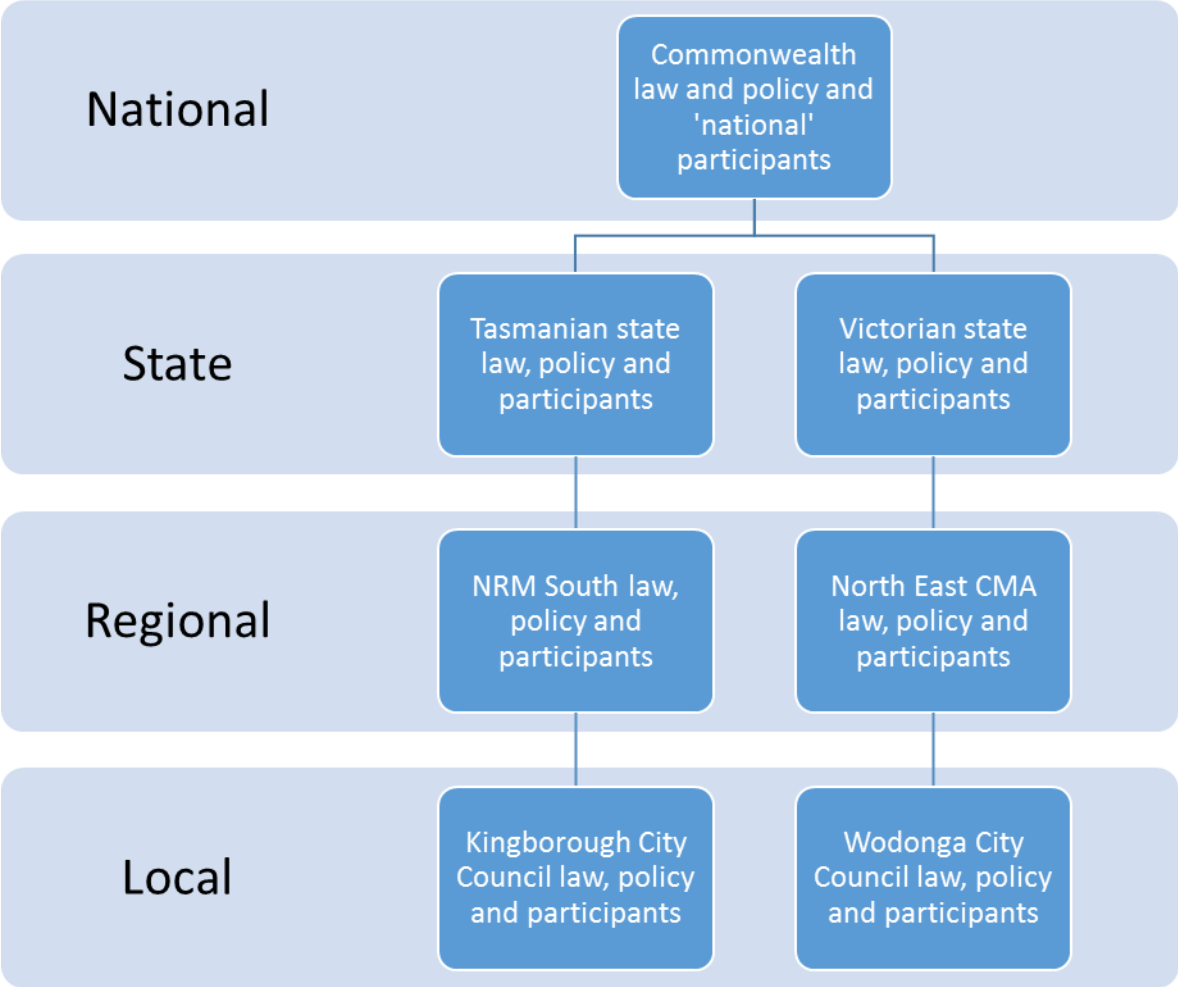

Figure 2.1 Illustrating the nested approach to multi-scale analysis adopted in this thesis

Tasmania and Victoria were selected for the nested state/regional/local components of this research for practical purposes – the research was conducted from Hobart, Tasmania providing ready access to Victorian and Tasmanian stakeholders for interviewing – but also because the two jurisdictions have major ecological and institutional differences that provide interesting points of comparison. For example, approximately half of Tasmania's land mass is protected in Australia's National Reserve System ('NRS'), the highest proportion of any state in Australia.[35] Victoria has the third lowest proportion of land in the

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[35] The most recent updates to the national Collaborative Australian Protected Area Database ('CAPAD') indicate that the Tasmanian reserve estate covers 42.31% or 2,894,327 hectares of its landmass, Australian Department of the Environment and Energy, 'CAPAD 2016: Tasmania' <http://www.environment.gov.au/land/nrs/science/capad/2016>; data from the Tasmanian Department of Primary Industries, Parks, Water and the Environment ('DPIPWE') indicate that the terrestrial reserve area actually covers 3,414,700 hectares or 50.1% of the state, as at 30 June 2016, DPIPWE, 'Tasmanian Reserve Estate Spatial Layer' <http://dpipwe.tas.gov.au/conservation/development-planning-conservation-

NRS at 17.2%.[36] Tasmania is one of the most ecologically connected states in Australia – due in large part to the large proportion of its land in NRS reserves and, in particular, the contiguous protected areas making up the South West Wilderness World Heritage Area.[37] Victoria is the most ecologically fragmented state in Australia, with a legacy of extensive land clearing and a high proportion of freehold land.[38] On the other hand, through the Land Conservation Council and its successors, Victoria has had the most effective process of any state in Australia for identifying and protecting representative examples of the state's species and ecosystems on public land, and is the 'highest spender per hectare' on protected area management.[39]

Both states have ageing conservation legal frameworks. For example, Tasmania's current protected area statutes were passed in 2002 but largely replicate the terms of their original iteration, the *National Parks and Wildlife Act 1970*.[40] Victoria's threatened species legislation, though currently under review, was enacted in 1988.[41] These two state jurisdictions are also important from a climate adaptation perspective because south eastern Australia, and Victoria and Tasmania in particular, have been identified as the location of the majority of future climate refugia for Australia's native species.[42]

This nested approach provides an opportunity to highlight areas of continuity between governance scales, for example, where Commonwealth and state conservation laws are operating effectively at the local level, and areas of disconnect or conflict, for example,

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assessment/planning-tools/tasmanian-reserve-estate-spatial-layer>; the territory of the ACT has a higher proportion of its area protected, with 55.5% but a total area of only 130,000 hectares.

[36] Despite the lower proportion of coverage, Victoria's reserve estate covered a larger total land area of 3,915,792 hectares, Australian Department of the Environment and Energy, 'CAPAD 2016: Victoria' <http://www.environment.gov.au/land/nrs/science/capad/2016>.

[37] Tasmania has relatively few 'ecosystem gaps' for NRS coverage, ranking 2nd for coverage among Australian jurisdictions, but some Tasmanian ecosystems are heavily fragmented and poorly protected, such as the woodlands and grasslands in the Tasmanian Midlands region, and habitat for many of the state's nationally listed threatened species, Taylor, Martin FJ et al, *Building nature's safety net 2011: the state of protected areas for Australia's ecosystems and wildlife* (WWF-Australia, 2011) 81.

[38] Ibid 82.

[39] Ibid; for more information on the influential work of the Land Conservation Council, now the Victorian Environmental Assessment Council ('VEAC'), see <http://www.veac.vic.gov.au/>.

[40] The relevant current statutes are: *National Parks and Reserves Management Act 2002* (Tas) and *Nature Conservation Act 2002* (Tas); see Tasmania, *Parliamentary Debates*, Legislative Council, 28 November 2002, 1-27 (Michael Aird, Leader of the Government in the Council).

[41] *Flora and Fauna Guarantee Act 1988* (Vic); *National Parks Act 1975* (Vic).

[42] Reside, April E et al, 'Climate change refugia for terrestrial biodiversity: defining areas that promote species persistence and ecosystem resilience in the face of global climate change' (National Climate Change Adaptation Research Facility, 2013).

where Commonwealth or state legal obligations are not effectively understood, implemented or enforced at lower scales. Continuity and disconnects across and between governance scales may have significant implications for effective climate adaptation responses in conservation legal frameworks.[43]

2.4.3. Doctrinal analysis

Doctrinal analysis is at the core of legal research, and developed as a research method "intuitively" out of legal practice.[44] The analytical method has only relatively recently become the subject of detailed consideration and explanation.[45] Doctrinal analysis remains one of 'the defining characteristics of academic legal research'.[46] At a very general level, doctrinal research involves identifying, synthesising and explaining the significance of legal rules, principles, norms, values and interpretive guidelines.[47] In keeping with the critical realism framework and methodological perspectives of this research, the doctrinal method adopted here is not an objective, positivist process revealing the 'truth' of what the law is.[48] Rather, it is a 'phronetic', or in-depth interdisciplinary process, 'directed at pragmatic problem solving' and at 'finding pragmatic solutions'.[49]

Doctrinal analysis has been used in this thesis to identify and analyse the legal instruments – legislation, regulations, by-laws, planning schemes and statutory strategies and management plans – that set the purposes, rules, decision-making processes and enforcement regimes for biodiversity conservation in Australia. Doctrinal analysis is employed first in the analysis in Chapter 4, where the relevant components of the conservation legal frameworks are identified in detail. Doctrinal analyses are also embedded in each chapter that investigates an adaptation strategy in detail (Chapters 5 to 8), to establish the legal context in which each of the strategies operate, and to underpin recommendations for reform.

[43] Urwina, K and J Jordan, 'Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance' (2008) 18 *Global Environmental Change* 180.
[44] Hutchinson, Terry and Nigel Duncan, 'Defining and describing what we do: doctrinal legal research' (2012) 17(1) *Deakin Law Review* 83.
[45] Ibid.
[46] Chynoweth, above n 2, 31.
[47] Hutchinson, above n 44, 84-5; Peczenik, Aleksander, 'Can philosophy help legal doctrine?' (2004) 17(1) *Ratio Juris* 106.
[48] *Cf* legal positivism, McKerchar, above n 2, 72-3.
[49] Murphy and McGee, above n 12, 1.

2.4.4. Semi-structured interviews

Primary data for this thesis was gathered through 40 semi-structured interviews with conservation agency staff, academics, consultants and other stakeholders conducted in 2014 and 2015.[50] These key informant interviews, ensured that the research took into account the complex operation of laws and policies in the 'real world'.[51] Participants were selected using a purposive sampling approach to achieve diversity across a range of specified criteria – such as governance scale and 'categories' of expertise – rather than a statistically representative sample.[52] The sampling approach targeted potential participants across national, state, regional and local governance scales in the nested analysis jurisdictions;[53] and across a range of academic, government and policy, environmental consultant and NGO and conservation advocacy contexts.

Fourteen of the 40 participants contributed a national perspective, including two employees of the Commonwealth Department of the Environment, as it then was, six academics, two representatives of advocacy organisations and four environmental consultants. Eleven participants were based in Victoria, with two of those employed by NECMA and two by the Wodonga City Council. Fifteen participants were based in Tasmania and, as in Victoria, two of those participants were associated with NRM South and two with the Kingborough City Council (Figure 2.2). Some participants could have been grouped into more than one category, for example, participants located in one of the state jurisdictions that spoke exclusively or primarily about national issues, or representing a national advocacy organisation but spoke exclusively about state-based conservation laws and policies. Each of those participants were allocated the category that best fit their interview contribution, after their interview was transcribed.

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[50] A full list of participants is set out in Appendix 2.
[51] In keeping with the critical realism framework discussed above; Gilchrist, VJ 'Key informant interviews' in Crabtree BF and WL Miller (eds) *Research methods for primary care, vol. 3: doing qualitative research* (Sage Publications, 1992) 70; this approach does not purport to be a quantitative, probabilistic 'expert elicitation' process, see Morgan, M. Granger, 'Use (and abuse) of expert elicitation in support of decision making for public policy' (2014) 111(20) (May 20, 2014) *Proceedings of the National Academy of Sciences* 7176.
[52] Eg Trost, Jan E, 'Statistically nonrepresentative stratified sampling: a sampling technique for qualitative studies' (1986) 911(Spring) *Qualitative Sociology* 54.
[53] Each participant agreed to be interviewed in their professional or representative capacity; Appendix 2 details the expertise represented in the key informant interviews.

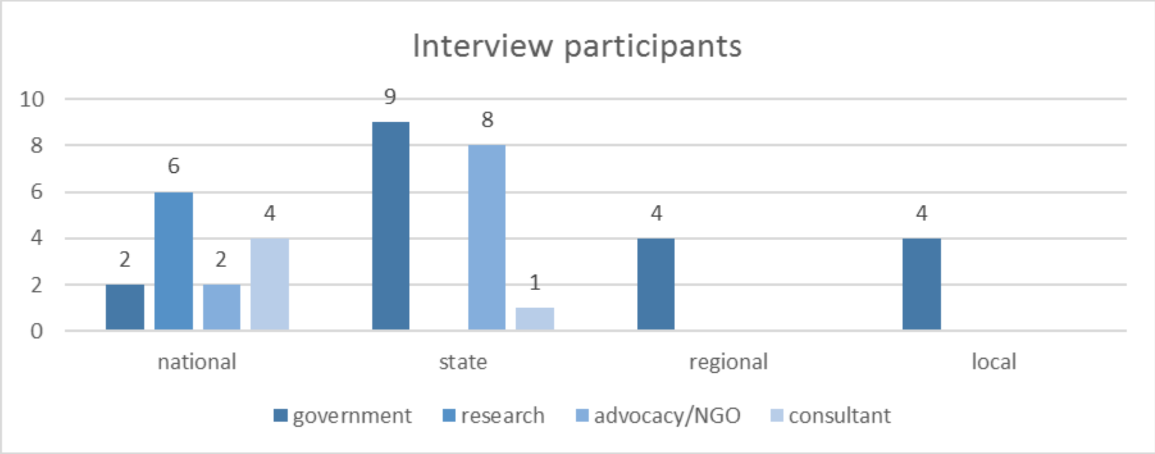

Figure 2.2 Number of interview participants by governance scale and expertise

To maximise the value of the data collected, the project targeted *informed* stakeholders at each governance scale and in each of the contexts listed above. Informed stakeholders are defined here as individuals with demonstrated specialised knowledge about the operation of conservation law and climate adaptation in Australia. Expertise was determined according to experience in climate change adaptation projects, through authoring peer-reviewed publications, or as a result of a relevant academic or organisational position.[54]

A major strength of key informant interviews as a qualitative research method is that they do not seek consensus from participants on any issue, but highlight diversity and areas of agreement and disagreement that may not be voiced in more public fora.[55] The research interviews were semi-structured. This approach provided some continuity in the data collected across different interviews and adaptation strategies, but also ensured sufficient flexibility for participants to express value positions;[56] emphasise perceived links between the broad questions and their own experiences;[57] and introduce new themes and concepts that were not identified in the literature review.

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[54] A similar process was adopted by Hagerman and colleagues, Hagerman, Shannon et al, 'Expert views on biodiversity conservation in an era of climate change' (2010) 20(1) *Global Environmental Change* 192.
[55] Hagerman, above n 54, 194-5.
[56] Both biodiversity conservation and climate adaptation can be described as 'mission-oriented' issues, involving strongly-held value positions as well as requiring technical and practical expertise, Meine, Curt, Michael Soulé and Reed F Noss, '"A mission-driven discipline": the growth of conservation biology' (2006) 20(3) *Conservation Biology* 631; Hagerman, above n 54, 194-5.
[57] Silverman D, *Doing qualitative research: a practical handbook* (Sage Publications Ltd, 3rd ed, 2010) 194.

Potential participants were identified through government agency directories, web searches for well-known conservation NGOs and statutory agencies, and through the thesis supervision team's networks. Each was sent an invitation email, attaching an indicative interview schedule, a project information sheet and an ethics consent form.[58] Participants all read the information sheet before the interview, and were asked to sign an ethics consent form. Interviews took approximately 45 minutes. Most interviews were conducted in person, with a small number conducted by telephone or Skype.

The indicative interview schedule contained eight overarching questions designed to investigate the practical operation of conservation legal frameworks in facilitating or hindering adaptation (see Appendix 1). Participants were also encouraged throughout the interview to reflect on and make suggestions about opportunities for law reform to overcome the challenges that they identified.[59] Each interview began with a question about the need to revise conservation legal objectives in the context of climate change. The next two questions were directed to the establishment of new, adaptation-oriented protected areas; and a fourth question to the legal frameworks for managing protected areas under climate change. The fifth question asked participants to identify the most important non-climatic stressor for biodiversity, in their experience or observation, and to discuss legal options for addressing that stressor to increase the adaptive capacity of species and ecosystems as the climate changes.

The final three interview questions were very general. Question six asked participants to identify existing laws that are already facilitating climate adaptation, and question seven asked about laws that currently create challenges for helping biodiversity to adapt. The final 'catch all' question asked whether anything important had been missed or whether there was anything more to add to previous answers. These three general questions encouraged participants to discuss practical examples of their experiences with existing conservation law and policy, highlighting particular areas of concern or enthusiasm that were not captured by more specific questions. In answering these general questions, participants raised challenges and opportunities for law that had not been identified in the doctrinal analysis and were not prominent in the formal biodiversity adaptation literature.

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[58] Appendix 1.
[59] Eg Chapter 7, Table 7.1.

The overarching interview questions did not explicitly prompt discussion about some important adaptation concepts – such as conserving refugia, pursuing connectivity and engaging in adaptation-oriented *ex situ* conservation. These concepts were not included in the overarching questions due to practical constraints such as time limits, and research decisions about, for example, the volume of literature already available on these issues, and the expertise of participants. However, the semi-structured nature of the interviews allowed these concepts to be raised, either by the researcher or the participants, as part of an answer to one of the substantive or general questions described above. The semi-structured interview approach also meant that on the few occasions that a participant chose not to answer a particular research question – because it was outside their expertise or raised sensitive political issues – the question could be omitted.

At the conclusion of each interview, participants were encouraged to share the invitation to participate with interested colleagues. They were also asked to share the information sheet and the researcher's contact details so that new participants could initiate contact if they were happy to do so – avoiding ethical concerns associated with 'snowball' or chain referral sampling.[60]

An additional 33 people were contacted but not interviewed.[61] Some initially expressed interest but did not respond to follow up contact, while others did not respond to the initial invitation. Some chose not to participate or, having indicated an interest, excused themselves before the interview took place. There were a range of reasons for withdrawing from participation, including personal reasons; the potential participant identifying an alternative participant that they considered would be more useful to the research; or their unavailability during the interview period. A particular challenge for securing interviews was that the interview period coincided with the lead up to a Victorian state election, so many Victorian government employees were unable, or unwilling, to be involved.[62]

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[60] See, eg Brace-Govan, Jan, 'Issues in snowball sampling: the lawyer, the model and ethics' (2004) 4(1) *Qualitative Research Journal* 52.

[61] Appendix 2 includes a list of organisations that were contacted but which did not result in an interview.

[62] Four of the nine state government participants listed in Figure 2.2 were from the Tasmanian Department of Primary Industries, Parks, Water and the Environment (DPIPWE), four were employed by Victorian statutory authorities (Parks Victoria or Trust for Nature) and only one was employed by the Victorian Department of Environment, Land, Water and Planning (DELWP).

Participants' responses are used throughout this thesis to provide examples, and to illustrate and provide practical context to the arguments made. However, there are not large numbers or an even division of participants from each of the nested jurisdictions. To ensure that participants are effectively de-identified, interview responses cited in this thesis are referenced either as: (1) 'local', 'regional', 'state' or 'national', or (2) 'government', 'research', 'advocate' or 'consultant', but not both.[63]

2.4.5. Interview data thematic analysis

All interviews were audio-recorded and transcribed, generating primary data for analysis and reporting. The interview transcripts and audio are referred to as 'interview data' in this research, to distinguish them from the data generated in the statutory protected area management plan review, described at Section 2.4.6, below.

The interview data were systematically coded and analysed using NVivo software. NVivo is a qualitative data analysis tool produced by QSR International.[64] It is designed for analysing rich, text-based data, including interview and focus group transcripts and audio, key research materials such as journal articles case law and grey literature, and qualitative data obtained through surveys.

Thematic analysis for interview data in this research included identifying competing and complementary themes that emerged from interview transcripts and audio.[65] In this thesis, a pragmatic approach to analysis was adopted, including note taking on general themes during and immediately after each interview;[66] and a deductive, 'first stage' of analysis that coded interview data to 'closed', pre-defined codes. Deductive qualitative analysis is

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[63] The format of each reference was selected to best reflect the perspective of the participant, for the point being made.
[64] See QSR International, 'What is NVivo?' <http://www.qsrinternational.com/nvivo/what-is-nvivo>.
[65] Newell, Robert and Philip Burnard (eds) *Research for evidence based practice in healthcare* (Wiley-Blackwell Publishing, 2nd edition, 2011) 119; Vaismoradi M, H Turunen and T Bondas, 'Content analysis and thematic analysis: implications for conducting a qualitative descriptive study' (2013) 15 *Nursing and Health Sciences* 398, 403.
[66] Including to record any important impressions, stand-out issues, new concepts, or links between interview responses during, and immediately or shortly after, each interview, Newell and Burnard, above n 65, 119; Burnard P et al, 'Analysing and presenting qualitative data' (2008) 204(8) *British Dental Journal* 429, 430.

guided by existing theory and predetermined structures or frameworks,[67] rather than evolving primarily from the data.[68] Deductive research begins with preliminary guiding themes or codes that are tested and potentially changed in the course of the coding and analysis.[69] In this thesis, a 'node', or category to which data was to be coded, was set up for each overarching interview schedule question. Answers to each interview question were coded into the corresponding node, supporting analysis across participants on their answers to each interview question. This deductive approach is efficient and relatively streamlined, but can be inflexible, limiting the development of new themes and theories.[70]

In a second, inductive stage of the analysis, the interview data were reviewed again and coded into 'open' or thematic nodes. The open nodes captured aspects of the data that overlapped interview questions or participants, and raised new, unexpected or cross-cutting themes.[71] Inductive analysis involves 'analysing data with little or no predetermined theory, structure or framework', relying instead on 'the data itself to derive the structure of analysis'.[72] While inductive analysis can be a time-consuming process, it explicitly seeks to identify novel and unexpected concepts and issues within the data that have not been identified in pre-existing research.[73] Inductive analysis can also provide an opportunity to identify, acknowledge and engage with 'negative instances' or 'deviant cases', that do not fit into the interview schedule's pre-determined categories.[74]

Supplementing the deductive analysis with an inductive component can support a more complete understanding of the topic; result in novel and innovative research outcomes; and

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[67] Schadewitz N and T Jachna, 'Comparing inductive and deductive methodologies for design patterns identification and articulation' (Presentation to the International Association of Societies of Design Research, Hong Kong, 12-15 November 2007) 2; Burnard et al, above n 66, 429.
[68] Epitomised in grounded theory research and Glasser and Strauss' theoretical position, see Walker D and F Myrick, 'Grounded theory: an exploration of process and procedure' (2006) 16(4) *Qualitative Health Research* 547, 547.
[69] Gilgun J, 'Coding in deductive qualitative analysis' (2013) <www.slideshare.net/JaneGilgun/deductive-qualitative-analysis-theory-testing?related=1> 1.
[70] Burnard et al, above n 66, 429.
[71] Similar to Burnard et al's concept of 'open coding', ibid 430.
[72] Blackstone, Amy 'Inductive or deductive? Two different approaches' in Amy Blackstone, *Sociological Inquiry Principles: Qualitative and Quantitative Methods* (Creative Commons, 1st ed, 2012); Burnard et al, above n 66, 429.
[73] Seidman I, *Interviewing as Qualitative Research: a guide for researchers in education and the social sciences* (Teachers College Press, 3rd ed, 2005) 26; Rapley, Tim 'Encountering method: interviews', in C Seale et al (eds) *Qualitative Research Practice* (Sage Publications, 2004) 15.
[74] Ibid.

help to address critiques about research reliability and credibility on the basis of researcher bias and closed analysis categories.[75] The inductive analysis was conducted after the thesis chapters on each adaptation strategy had been drafted, to maximise opportunities to identify themes that transcended the adaptation strategy-specific categories established for each interview question. The deductive/inductive mixed approach to data analysis accords with the pragmatic, critical realism framework adopted in this thesis.[76]

2.4.6. Statutory management plan analysis

In addition to the interview data gathered for this thesis as a whole, Chapter 6 is underpinned by a comprehensive review of statutory management plans for Tasmanian, Victorian and Commonwealth public protected areas.[77] This section details the purpose of the management plan review and its contribution to answering the thesis research questions. This section also sets out the method used to gather and analyse the management plan data. The results of this analysis are described in detail in Chapter 6.

The management plan analysis covered every statutory protected area management plan available online for Tasmanian, Victorian and Commonwealth public protected areas, as at 1 April 2016.[78] The review was designed to demonstrate how protected area legislation is operationalised at the site-specific scale in public protected areas, and to investigate the extent of climate adaptation planning for those public protected areas. Management plans for public protected areas were selected as the focus for the review because the majority of land in the National Reserve System is government or community-owned and managed;[79] the legal framework for protected area management primarily targets public land; and

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[75] Burnard et al, above n 66, 429-432.
[76] Elo S and H Kyngäs, 'The qualitative content analysis process' (2008) 62(1) *J Adv Nurs* 107; Schutt RK, *Investigating the social world: the process and practice of research* (Pine Forge Press, 2006) 77; Blackstone, above n 72.
[77] 'Public protected areas' include government, joint management and community protected areas, Australian Department of the Environment and Energy, 'Ownership of protected areas' <http://www.environment.gov.au/land/nrs/about-nrs/ownership> ('NRS Ownership').
[78] Statutory management plans were identified as plans required under legislation for managing protected areas; including under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth), *National Parks and Reserves Management Act 2002* (Tas), *National Parks Act 1975* (Vic), the *Crown Land (Reserves) Act 1978* (Vic), and *Wildlife Act 1975* (Vic); see Chapter 6.
[79] As at 2016, ownership of the National Reserve System ('NRS') was, as follows: government 44.39%, indigenous 44.25%, joint management 5.6% and private 5.77%, NRS Ownership, above n 77.

because few private protected area plans are available online.[80] The results of this management plan review provide valuable insights into the extent of climate adaptation planning in Tasmanian, Victorian and Commonwealth protected area management. The review also illustrates broader trends in climate adaptation planning in public protected areas in Australia, and lessons for the kinds of legal reforms that may be needed to guide adaptation-oriented management planning in Australia and elsewhere.

(a) Climate change

The management plan review sought to identify whether and how statutory protected area management plans refer to climate change[81] and a selection of other key concepts for biodiversity adaptation. One hundred and forty-three statutory management plans were analysed in the qualitative data analysis software, NVivo.[82] The review was designed to provide a preliminary overview of adaptation planning in this context, so this content analysis relied exclusively on deductive coding. The first stage of analysis was to identify all references to the concept of climate change using the Boolean search terms: 'climat*' – to identify occurrences of the words climate, climatic and climates – 'global warming' and 'sea level rise'. The results of the Boolean search were reviewed to exclude references to historical climatic changes, including past ice ages, to ensure that the remaining results illustrated whether anthropogenic climate change is being recognised as a future challenge to statutory management planning and conserving protected areas over the long term.

Management plans that referred to the concept of climate change were then searched for references to, and management prescriptions about refugia and adaptive management.[83] The remainder of this section details the definitions used and the significance of these concepts for the current research.

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[80] With the exception of management plans prepared by the Tasmanian Land Conservancy, most of which are available at: <http://tasland.org.au/reserves/>, a full list of the plans reviewed for this analysis is set out in Appendix 4.

[81] Because without acknowledging the concept of climate change, management plans cannot establish climate adaptation-oriented approaches to management.

[82] For deductive analysis and NVivo software, see Section 2.4.5.

[83] Searches included synonyms and derivatives such as 'refuge', 'refugium' and 'adaptable management'; the concept of management prescriptions is defined, below.

(b) Refugia

Protecting or enhancing refugia in Australia's protected areas has been identified as a critical focus for climate adaptation in managing the National Reserve System.[84] Refugia are defined as "habitats that components of biodiversity retreat to, persist in, and can potentially expand from under changing climatic conditions".[85] This is a particularly important concept in Australia where independent dispersal to track shifting climate conditions will be restricted by factors including a relatively flat and inhospitable landscape, and significant human and environmental barriers including deserts, cities and the ocean.[86] Identifying, protecting and managing refugia is a conservation strategy that may present the best chance that many Australian species have to persist as rapid climate change triggers increasing numbers of species to become threatened and face extinction, placing additional pressure on already limited conservation budgets.

(c) Adaptive management

Adaptive management is a management approach that promotes 'learning while doing' and has been described as 'pivotal' in climate change adaptation law.[87] There is 'virtual consensus' about its utility in developing adaptation-oriented law for conservation and environmental management.[88] Demonstrating that an area will be managed according to adaptive management principles is also one of the standards required for including an area in the NRS, and is referenced heavily in protected area management literature.[89] This analysis focused on the following key components of adaptive management in practice:

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[84] Dunlop, Michael et al, *Implications for policymakers: climate change, biodiversity conservation and the National Reserve System* (CSIRO Climate Adaptation Flagship, 2012).
[85] Reside, above n 42.
[86] Ibid; Donatiu, Paul, *The impact of climate change on rare flora: identifying and protecting climate refugia, a Churchill Fellowship report* (The Winston Churchill Memorial Trust of Australia, 2009).
[87] Fischman, Robert L and Jillian R Rountree, 'Adaptive management' in Michael B Gerrard and Katrina Fischer Kuh (eds) *The law of adaptation to climate change: U.S. and international aspects* (American Bar Association, 2012) 19, 29-30.
[88] Ibid 19; Chapter 4, Section 4.3, Principle 3.
[89] Dudley, Nigel (ed) *IUCN guidelines for applying protected area management categories: best practice guidance on recognising protected areas and assigning management categories and governance types* (International Union for the Conservation of Nature, 2008) 12; and eg Moore, CT et al, 'Adaptive management in the U.S. National Wildlife Refuge System: science-management partnerships for conservation delivery' (2011) 92(5) *J Environ Manage* 1395; Williams BK and ED Brown, 'Adaptive management: from more talk to real action' (2014) 53(2) *Environ Manage* 465.

monitoring, linking monitoring results to management action, and identifying qualitative or quantitative triggers or thresholds for taking action.[90]

(d) Connectivity

Connectivity is commonly considered to be a crucial strategy for promoting biodiversity adaptation under climate change.[91] However, connectivity was not used as a key search term in this content analysis because preliminary searches – for Boolean search terms including ‘connec!’, ‘neighbouring’, and ‘adjoining’ – returned results in almost every management plan. Many statutory management plans included standard, often pro forma, provisions for ‘neighbour programs’ and engaging with bordering landholders and, in Victoria in particular, provisions about riparian connectivity in compliance with the *Heritage Rivers Act 1992* (Vic).[92] These references typically did not relate to connectivity for climate adaptation, and an analysis of the large volume of data returned in that search was beyond the scope of the analysis for Chapter 6. Examples of pro forma connectivity provisions from statutory management plans are extracted in Chapter 6, as the basis for recommendations about engaging across protected area boundaries, to implement the connectivity strategy for biodiversity adaptation.

Statutory management plans tend to be dominated by lengthy descriptions of the planning area to which they apply, including its geological and ecological history, native species and ecological communities, and existing threats to management values such as biodiversity. Discussion of the results of this analysis in Chapter 6 do not focus on those descriptions but on the way that the concepts defined above are used in management *prescriptions*, that is, in each plan’s explicit goals, objectives and implementation strategies directing management to particular actions or outcomes.

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[90] Drawing on Meretsky, VJ and R Fischman, ‘Learning from conservation planning for the U.S. National Wildlife Refuges’ (2014) 28(5) *Conservation Biology* 1415.
[91] Chapter 3, Section 3.3.2.
[92] A brief review of these results suggested that these provisions do not reflect the kind of dynamic and integrated bioregional or landscape-scale management that is contemplated by the connectivity for climate adaptation literature, eg Worboys, Graeme L, Wendy L Francis and Michael Lockwood (eds) *Connectivity conservation management: a global guide* (Earthscan, 2010).

2.5. Summary of how the research methods are combined in this thesis

Chapter 3 sets out the results of a critical literature review of each adaptation strategy. It uses interview data to add an Australian-specific perspective on the review of international and Australian adaptation and conservation scholarship. Chapter 4 establishes the legal context for the thesis as a whole, investigating how climate change creates challenges for existing law, policy and conservation practice. It draws on both doctrinal analyses and interview data about the purposes and objects of conservation law, to illustrate the challenge of climate change for facilitating adaptation using Australia's legal frameworks for conservation.

The thesis chapters that focus on each of the adaptation strategies – Chapters 5 (protected area establishment), 6 (protected area management), 7 (non-climatic stressors) and 8 (conservation introductions) – draw on both doctrinal analysis of existing legal frameworks and interview data. Those chapters rely on both forms of data to make recommendations for enhancing the efficiency and effectiveness of Australia's conservation legal framework for promoting biodiversity adaptation under climate change. Chapter 9 concludes this thesis, highlighting specific findings about the adaptation strategies, and the broader implications of those findings for legal frameworks for conservation in a rapidly changing climate.

Chapter 3 Biodiversity conservation and climate adaptation: theory and scholarship

This chapter draws on research first published in Phillipa McCormack and Jan McDonald, ‘Adaptation strategies for biodiversity conservation: Has Australian law got what it takes?’ (2014) 31 *Environmental and Planning Law Journal* 114-136. Permission has been granted from the Publisher to reproduce sections of this article in this chapter.

3.1 Overview

This chapter introduces key concepts from adaptation theory and applies them to the biodiversity-specific context of this thesis. In order to answer the overarching research question of how can Australia’s conservation legal frameworks facilitate adaptation to climate change, this chapter investigates what biodiversity adaptation really means. Section 3.2 introduces the concept of climate adaptation for biodiversity conservation in detail, distinguishing between ‘types’ and ‘modes’ of adaptation response for conservation and biodiversity management. Section 3.3 outlines the results of the conservation and climate adaptation literature review conducted for this thesis. The literature review investigates the key characteristics of each of the biodiversity adaptation strategies introduced in Chapter 1, to answer research question II.[1] These characteristics provide the background to the analyses in Chapters 5, 6, 7 and 8, of how each of the adaptation strategies is currently represented in Australian conservation legal frameworks.[2]

3.2 Climate change adaptation theory and biodiversity conservation

Climate change mitigation efforts have so far failed to cap global greenhouse gas emissions and some level of unavoidable warming is now ‘locked in’ to the global climate

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[1] RQII asks: *What does the literature suggest are the key characteristics of these strategies for enhancing biodiversity adaptation outcomes?*

[2] Chapters 5 to 8 answer the remaining research questions (RQ), RQIII: *To what extent are these strategies currently represented in Australia’s legal frameworks for biodiversity conservation?*; RQIV: *To what extent do Australian legal frameworks for biodiversity conservation hinder or promote the effective implementation of these strategies?*; and RQV: *How can Australian law be reformed to improve the representation and implementation of these strategies?*

system.[3] Existing conservation laws and policies will be unable to maintain the environmental *status quo* because 'committed' global warming will cause dramatic changes to Earth's climate and its biodiversity.[4] As a result, if they are to survive, species, ecological communities and whole ecosystems will need to adapt to changing climates, independently or with human help. Section 3.2.1 describes two different 'types' of adaptation response as autonomous adaptation and planned adaptation. Section 3.2.2 describes a spectrum of the 'modes' of adaptation response available to decision makers as they pursue planned adaptation, from resisting change and facilitating ecological transition through to managing ecosystem transformation.

3.2.1 Types of adaptation response – autonomous and planned

The IPCC distinguishes between *autonomous* and *planned* actions as distinct types of adaptation response, defining autonomous or spontaneous adaptation as a 'response to experienced climate and its effects' without explicit or conscious planning to respond to climate change.[5] Planned or anticipatory adaptation involves a deliberate decision by humans to intervene to achieve a desired outcome in light of anticipated climate impacts. For example, eradicating non-climate stressors such as invasive species, and relocating a species outside of its historical range to prevent climate-induced extinction, can both be characterised as planned adaptation actions.[6] Autonomous adaptation in natural systems may include changes in migration times and destinations, the composition of ecological communities, and genetic changes; any of which may result in broader ecosystem transitions or transformation to new states.[7] Legal frameworks that support biodiversity

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[3] Intergovernmental Panel on Climate Change ('IPCC'), 'Summary for policymakers' in CB Field et al (eds), *Climate Change 2014: Impacts, Adaptation and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the fifth assessment report of the IPCC* (Cambridge University Press, 2014) 1.2, 2.1 ('IPCC summary for policymakers').
[4] Ibid.
[5] Mach KJ, S Planton and C von Stechow (eds), 'Annex II: Glossary' in IPCC, *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the IPCC* (Cambridge University Press, 2014) ('IPCC AR5 Glossary') 1759.
[6] Christensen JH et al, 'Climate Phenomena and their Relevance for Future Regional Climate Change', in Stocker TF et al, *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the IPCC* (Cambridge University Press, 2013) 839; autonomous and planned adaptation are value-neutral terms, that is, neither is intrinsically 'good' or 'bad', but simply methods of change in the components and interactions of biodiversity at local, regional, national and global scales; although all changes will be valued in different ways and have real-life implications for interested and/or affected human communities.
[7] Along with phenological changes and 'phenotypic acclimation', ibid 838.

adaptation, promote planned adaptation. Autonomous adaptation may incidentally be enhanced through planned adaptation, for example, if shifting a population to a new habitat outside its historical distribution provides sufficient time for genetic adaptations to occur. However, the scale and rapid rate of climate change is expected to outpace the evolutionary potential for most autonomous adaptations for biodiversity.[8]

Effective, planned biodiversity adaptation will require greater understanding about likely climate impacts on biodiversity and associated climate vulnerabilities.[9] Vulnerability is defined as ‘the propensity or predisposition to be adversely affected’, and encompasses a range of concepts including species’, ecological communities’ and ecosystems’ exposure to climate change, sensitivity to that exposure, and capacity to adapt.[10] Understanding the intersection between impacts and vulnerabilities can ensure that adaptation strategies are designed to address those features, rather than in an ad hoc or fragmented way.[11] Of course, effective adaptation will require that adaptation strategies are also *implemented*, an issue that has often been neglected in climate adaptation research.[12]

Planned adaptation responses directed at one particular biodiversity scale – such as genetic diversity or a particular species population – will generally have implications for other, interacting components of biodiversity. Implications may involve mutual benefits, but ‘what is viewed as adaptive for one conservation purpose might be detrimental (or ‘maladaptive’) for another’.[13] Planned biodiversity adaptation requires great attentiveness to the interactions between conservation decision making across tenures, bioregions, legal

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[8] Eg Thomas, Chris D et al, ‘Extinction risk from climate change’ (2004) 427 *Nature* 145; Burrows MT et al, ‘Geographical limits to species-range shifts are suggested by climate velocity’ (2014) 507 *Nature* 492.
[9] Although prioritisation frameworks are reducing the risk of acting despite uncertainty, eg Fordham, Damien A et al, ‘Predicting and mitigating future biodiversity loss using long-term ecological proxies’ (2016) 6(10) *Nature Clim Change* 909; Ford, James D, ‘Emerging trends in climate change policy: the role of adaptation’ (2008) 3(2) *International Public Policy Review* 5.
[10] IPCC AR5 Glossary, above n 5, 1775; Pacifici, Michela et al, ‘Assessing species vulnerability to climate change’ (2015) 5 *Nature Climate Change* 215; Dickinson, Maria G et al, ‘Separating sensitivity from exposure in assessing risk from climate change’ (2014) 4 *Scientific Reports* 6898; vulnerability as a characteristic of decision-making processes has also recently been the subject of investigation, Gorddard R et al ‘Values, rules and knowledge: adaptation as change in the decision context’ (2016) 57 *Environmental Science & Policy* 60.
[11] Stein, Bruce A et al, ‘Preparing for and managing change: climate adaptation for biodiversity and ecosystems’ (2013) 11(9) *Frontiers in Ecology and the Environment* 502, 505.
[12] Moser Susanne C, ‘Whether our levers are long enough and the fulcrum strong: exploring the soft underbelly of adaptation decisions and actions’ in Irene Lorenzoni, W Neil Adger and Karen L O'Brien, *Adapting to climate change: thresholds, values, governance* (Cambridge University Press, 2009) 313, 314.
[13] Stein et al, above n 11, 503.

frameworks and governance scales to minimise the risk of an intervention inadvertently reducing the adaptive capacity of non-target biodiversity.[14]

3.2.2 Modes of adaptation – resistance, transition and transformation

Planned adaptation responses fall into different modes, ranging from *resisting* change or facilitating *transition*, through to facilitating or triggering fundamental system *transformation*.[15] These modes can be understood in terms of changes to biodiversity and ecological interactions as well as to the structure and function of legal frameworks themselves.[16] Each adaptation mode has different characteristics for decision-making processes, applicable laws and policies, and the extent of information required to make decisions.[17] The concept of resilience, as a property of a social-ecological system, has been used to describe both the 'resistance' and 'transition' modes in this spectrum.[18] While the concept of resilience is increasingly prominent in environmental law scholarship, this thesis adopts the typology of resistance, transition and transformation for clarity, and to avoid confusion with the broader concept of resilience thinking.[19]

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[14] Decision makers must also anticipate conflict between biodiversity and human adaptation goals eg Watson, James EM and Daniel B Segan, 'Accommodating the human response for realistic adaptation planning: response to Gillson *et al*' (2013) 28(10) *Trends in Ecology & Evolution* 573, 574.

[15] This spectrum has been defined differently by different authors, eg JB Ruhl has described the 'modes of adaptation' as 'resist, transform, move', Ruhl JB, 'Climate change adaptation and the structural transformation of environmental law' (2010) 40 *Environmental Law* 363, 385-7; and Fischman and colleagues define it in terms of 'resistance', 'resilience' and 'transformation', Fischman, Robert L et al, 'Planning for adaptation to climate change: lessons from the US National Wildlife Refuge System' (2014) 64(11) *BioScience* 993, 1001; see also Poiani, Karen A et al, 'Redesigning biodiversity conservation projects for climate change: examples from the field' (2011) 20(1) *Biodiversity and Conservation* 185.

[16] Park SE et al, 'Informing adaptation responses to climate change through theories of transformation' (2012) 22(1) *Global Environmental Change* 115, 115; Ruhl JB, 'General design principles for resilience and adaptive capacity in legal systems - with applications to climate change adaptation' (2011) 89 *North Carolina Law Review* 1373.

[17] Park et al, above n 16, 116.

[18] Eg Heller, Nicole E and Erika S Zavaleta, 'Biodiversity management in the face of climate change: A review of 22 years of recommendations' (2009) 142(1) *Biological Conservation* 14; Fischman, above n 15, 1001; Morecroft, Michael D et al, 'Resilience to climate change: translating principles into practice' (2012) 49(3) *Journal of Applied Ecology* 547.

[19] Resilience thinking encompasses the whole spectrum of modes, anticipating the possibility – or inevitability over time – of system transformation, as a result of either planned or unplanned drivers of system change, focusing on the 'dynamics and development of complex social-ecological systems… [as they] interrelate across multiple scales', Folke C, 'Resilience thinking: integrating resilience, adaptability and transformability' (2010) 15(4) *Ecology and Society* 20.

Resistance is defined as 'the ability of a system to withstand a disturbance without significant loss of function'.[20] Resisting change by preserving the status quo is a common strategy in existing conservation laws, including where protected area laws seek to protect particular species mixes within defined, stationary boundaries.[21] In a climate adaptation context, resistance involves active intervention at one level of a system to make the whole system more able to absorb change, accepting that some changes to parts of the system may be unavoidable.[22] Resistance may be a socially- and ecologically-desirable adaptation strategy for conservation in some circumstances, especially in the short-term. Interventions to minimise change to, or loss of, climate refugia or ecosystem processes – for example, by manipulating or excluding fire regimes or actively watering a drying wetland system – may be deemed an appropriate and desirable short-term goal.[23] It is unlikely to be financially or ecologically viable in the long-term, particularly at large scales.[24] Resistance will be undesirable in many cases, particularly if it '…leaves systems vulnerable to total collapse if interventions are not maintained or compromise[s] other system components'.[25]

Transition as an adaptation response involves accepting or accommodating change, and taking decisions in the short term that keep open different adaptation options in the future. 'Adaptation pathways' decision tools are an example of support for a transition response to climate change.[26] Transition approaches may include relying on climate projections to

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[20] Glick, Patty, Helen Chmura and Bruce A Stein, *Moving the conservation goalposts: a review of climate change adaptation literature* (US National Wildlife Federation and National Council for Science and the Environment, 2011) 10.
[21] The term resistance is also used to describe avoiding loss from climate change, Heller and Zavaleta, above n 18, 25-6; Poiani, above n 15.
[22] Heller and Zavaleta, above n 18; Morecroft, above n 18, 548.
[23] Eg Stein, Bruce A et al, 'Adaptation to impacts of climate change on biodiversity, ecosystems and ecosystem services' in *Impacts of climate change on biodiversity, ecosystems, and ecosystem services: technical input to the 2013 U.S. National Climate Assessment* (2012) 244, 6-4; Hansen LJ, JL Biringer and JR Hoffman, *Buying time: a user's manual for building resistance and resilience to climate change in natural systems* (World Wildlife Fund, 2003).
[24] Millar, Constance I, Nathan L Stephenson and Scott L Stephens 'Climate change and forests of the future: managing in the face of uncertainty' (2007) 17 *Ecological Applications* 2145, 2147 describe it as a futile effort to 'paddle upstream'; Dunlop, Michael et al, *The implications of climate change for biodiversity conservation and the National Reserve System* (Final synthesis report prepared for the Australian Government, CSIRO Climate Adaptation Flagship, 2012) 21-2.
[25] Heller and Zavaleta, above n 18, 25.
[26] Commonwealth Scientific and Industrial Research Organisation, 'Enabling adaptation pathways' <https://research.csiro.au/eap/>; Wise RM et al, 'Reconceptualising adaptation to climate change as part of pathways of change and response' (2014) 28 *Global Environmental Change* 325.

justify listing currently healthy species populations as threatened,[27] or designating and conserving critical habitat that is projected to be lost under climate change.[28] These approaches would direct prioritised conservation planning effort towards climate vulnerabilities, and lend greater weight to climate-threatened biodiversity in land use planning decisions. While transition responses may be appropriate as a starting point, greenhouse gas emissions are not being reduced at the rate needed to limit global temperatures to 1.5 to 2℃ of warming. As the climate continues to change, ecological and legal transformations to facilitate biodiversity adaptation in the long-term will be necessary.[29]

Transformational change involves ‘efforts that enable or facilitate the transition of ecosystems to new functional states’.[30] For example, removing sea defences can facilitate, among other effects, ecological changes to intertidal zones, reshaped coastlines and the creation of new coastal habitats.[31] Transformation may include statutory protected area management plans accommodating or even requiring the creation of novel ecosystems within park boundaries to support biodiversity adaptation.[32] Transformational approaches may also involve engineering a complete changeover in vegetation in an ecosystem to achieve a ‘more desirable’ rather than ‘less desirable’ alternate ecosystem state. For example, with repeated, catastrophic, climate-driven wildfires in alpine forests, land managers may be faced with a high likelihood of ecosystem collapse.[33] Responses may include intervention to direct ecosystem transformation instead of collapse, for example, by introducing warm-adapted, non-alpine plant species from downslope to enhance the

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[27] Eg US National Marine Fisheries Service listed the (currently healthy) Bearded Seal (*Erignathus barbatus nauticus*) as a threatened species under the *Endangered Species Act 1973*, 16 USC § 1531 et seq (1973), on the basis that it will lose its habitat to climate change by the end of this century; a finding that was upheld on appeal in *Alaska Oil & Gas Association v. Pritzker* (9th Cir, 14-35806, 24/10/2016).
[28] Eg a decision to designate Polar Bear (*Ursus maritimus*) habitat as ‘critical habitat’ based primarily on climate change projections was similarly upheld, in *Alaska Oil and Gas Ass’n v. Jewell*, 815 F 3d 544, 551 (9th Cir. 2016).
[29] Poiani, above n 15, 198-9, transformation may include changing the area of existing conservation projects, and reprioritising or even abandoning some focal species or ecosystems.
[30] Stein et al, above n 11, 505; Park et al, above n 16, 119.
[31] Morecroft, above n 18, 548.
[32] For discussion of US climate adaptation and protected area management planning, see Fischman et al, above n 15.
[33] Bowman, David MJS et al, ‘Abrupt fire regime change may cause landscape-wide loss of mature obligate seeder forests’ (2014) 20(3) *Global Change Biology* 1008; Enright, Neal J et al, ‘Interval squeeze: altered fire regimes and demographic responses interact to threaten woody species persistence as climate changes’ (2015) 13(5) *Frontiers in Ecology and the Environment* 265.

adaptive capacity of the area and its habitat value for climate-driven species redistribution.[34] Transforming conservation laws for adaptation may include shifting the focus of legislative and policy priorities from the traditional concept of threatened species to 'climate-critical' or highly interactive species as the target of species-specific conservation;[35] or from species altogether, to a focus on conserving ecosystem health and function regardless of its components.[36] No biodiversity conservation legislation in Australia currently anticipates the potential for ecological transformation or provides guidance for decision-making processes that facilitate transformation in response to climate change.[37]

The adaptation modes available in any given scenario will depend on the extent of change that is being experienced by an ecological system.[38] In this thesis, resisting change is contemplated for short term goals in some limited contexts but most recommendations relate to actively promoting incremental or transformational adaptation.

3.3 Adaptation strategies for biodiversity under climate change

It has been clear for decades that climate change will imperil many species as well as the ecological interactions that support functioning ecosystems, in Australia and all over the world.[39] During that time, research about how conservation managers can help biodiversity to adapt under rapid climate change has proliferated across a variety of scientific

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[34] Bassett, Owen D et al, 'Aerial sowing stopped the loss of alpine ash (*Eucalyptus delegatensis*) forests burnt by three short-interval fires in the Alpine National Park, Victoria, Australia' (2015) 342 *Forest Ecology and Management* 39.
[35] Williams, Stephen E et al, 'Towards an integrated framework for assessing the vulnerability of species to climate change' (2008) 6(12) *PLoS Biology* e325; Thomas, Chris D et al, 'A framework for assessing threats and benefits to species responding to climate change' (2011) 2(2) *Methods in Ecology and Evolution* 125.
[36] Eg Mooney, Harold A, 'The ecosystem-service chain and the biological diversity crisis' (2010) 365(1537) *Philos Trans R Soc Lond B Biol Sci* 31; Moritz, Craig and Rosa Agudo, 'The future of species under climate change: resilience or decline?' (2013) 341(6145) *Science* 504.
[37] And see Craig, Robin K, '"Stationarity is dead" - long live transformation: five principles for climate change adaptation law' (2010) 34(1) *Harvard Environmental Law Review* 9; Ruhl, JB, 'Climate change and the Endangered Species Act: building bridges to the no-analog future' (2008) 88 *Boston University Law Review* 1.
[38] Park et al, above n 16, 119; Stein et al, above n 23, 6.4–6.5.
[39] See generally, 'IPCC summary for policymakers', above n 3; Reisinger A et al, 'Australasia' in VR Barros et al (eds), *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the IPCC* (Cambridge University Press, 2014) 1371; Steffen W et al, *Australia's biodiversity and climate change: a strategic assessment of the vulnerability of Australia's biodiversity to climate change* (Biodiversity and Natural Resource Management Adaptation Team, Commonwealth Department of Climate Change, 2009).

disciplines.[40] This section sets out the purpose and core characteristics of each of the most commonly discussed climate adaptation strategies for biodiversity,[41] as identified in that scientific scholarship.

The adaptation strategies that are the focus of this thesis are: to increase and enhance the protected area estate ('protected area strategy'); to conserve connectivity stepping stones and corridors, and improve landscape permeability ('connectivity strategy'); to reduce or remove non-climatic stressors on biodiversity ('non-climatic stressors strategy'); and to improve the use of *ex situ* conservation, including by translocating species outside of their historical ranges when necessary and appropriate ('*ex situ* strategy').[42] These strategies fall along a spectrum that is influenced by species' and ecosystems' vulnerability, climate preparedness, adaptive capacity, sensitivity and exposure to climate change, and barriers to dispersal, as illustrated in Figure 3.1.[43]

[40] Heller and Zavaleta, above n 18; Glick, Chmura and Stein, above n 20.
[41] Heller and Zavaleta, above n 18, 24, reviewed 113 scholarly articles on biodiversity conservation under climate change and identified 524 individual management recommendations, at 18-21; the authors found that recommendations to 'increase connectivity' were the most common (n=24) and to 'increase the number of reserves' was fifth most common (n=18) but, in total, 49 recommendations involved reserve *acquisition* and protected area *management* under climate change and there was consistent support for rapidly protecting more land.
[42] Introduced in Chapter 1, Section 1.4; Chapter 2, Section 2.4.1.
[43] Adapted from McCormack, Phillipa and Jan McDonald, 'Adaptation strategies for biodiversity conservation: has Australian law got what it takes?' (2014) 31 *Environmental and Planning Law Journal* 114, 117; used with permission of the Publisher, 9 January 2018.

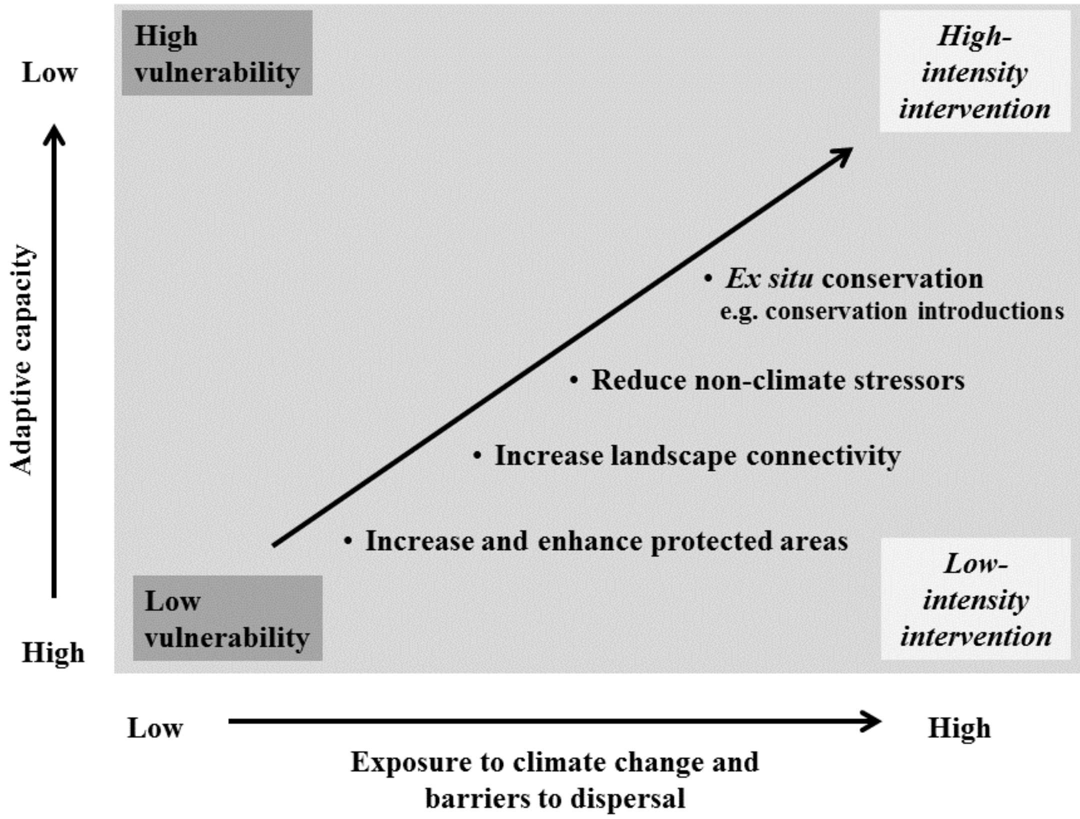

Figure 3.1 Spectrum of climate adaptation interventions for biodiversity conservation

3.3.1 Protected area strategy – increasing and enhancing the protected area estate

The protected area strategy represents the 'lowest intensity' strategy in this discussion, as it has the potential to benefit a broad range of biodiversity components at different scales, particularly those with high adaptive capacity and/or low exposure and sensitivity to climate change.[44] It also requires relatively less detailed information about management and specific climate impacts in its implementation than higher intensity strategies, such as the *ex situ* strategy.

There is wide support across climate adaptation and biodiversity conservation scholarship for rapidly expanding and enhancing protected area networks, including by increasing the

[44] McCormack and McDonald, above n 43, 118; Dunlop, Michael et al, *Implications for policymakers: climate change, biodiversity conservation and the National Reserve System* (CSIRO Climate Adaptation Flagship, 2012) 7.

number of protected areas, and their size, quality and diversity.[45] A protected area is defined as:

> A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values.[46]

Australia's National Reserve System (NRS) includes over 10,000 protected areas covering more than 17% of Australia's land area, most of which is publically owned and managed.[47] The NRS is described as an environmental 'safety net', providing a range of conservation benefits within and outside of the reserve estate.[48] Enhancing the NRS is widely recognised as a fundamental and robust strategy for biodiversity conservation under climate change.[49] However, climate change will have 'widespread and in many cases extreme' impacts on protected areas over the next 50 years.[50] Protected areas will be affected by climate-driven species redistributions and 'shuffling' species assemblages, by new and changing threats such as increased risks from bushfire, flooding and drought,[51] and as a result of indirect impacts such as adaptation in other sectors.[52]

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[45] Heller and Zavaleta, above n 18; Mawdsley, JR, R O'Malley and DS Ojima, 'A review of climate-change adaptation strategies for wildlife management and biodiversity conservation' (2009) 23(5) *Conserv Biol* 1080; Dunlop et al, above n 44; Scott D and Lemieux C, 'Climate Change and Protected Area Policy and Planning in Canada' (2005) 81(5) *The Forestry Chronicle* 696.

[46] Dudley N (ed) *IUCN Guidelines for Applying Protected Area Management Categories* (International Union for the Conservation of Nature ('IUCN') Publications Services, 2008) 8.

[47] Australian Department of the Environment and Energy, 'Ownership of Protected Areas' <www.environment.gov.au/land/nrs/about-nrs/ownership>.

[48] Ibid; Dunlop et al, above n 44.

[49] Dunlop et al, above n 24; Thomas, CD et al, 'Protected areas facilitate species' range expansions' (2012) 109(35) *Proceedings of the National Academy of Science U S A* 14063; Hiley, Jonathan R et al, 'Protected areas act as establishment centres for species colonizing the UK' (2013) 280(1760) *Proceedings of the Royal Society B: Biological Sciences* 2.012231E7, finding that as species shifted their geographical ranges, they colonised protected areas before establishing viable populations outside those areas.

[50] Dunlop et al, above n 44, 3.

[51] Dunlop, M and PR Brown, *Implications of climate change for Australia's National Reserve System* (A preliminary assessment report to the Commonwealth Department of Climate Change, 2008).

[52] McCormack and McDonald, above n 43, 119, including the relocation of coastal settlements inland, Department of Climate Change, Commonwealth Government, *Climate change risks to Australia's coasts: a first pass national assessment* (2009); McDonald J, 'Mapping the legal landscape of climate change adaptation' in Bonyhady, Tim, Andrew Macintosh and Jan McDonald (eds), *Adaptation to climate change: law and policy* (The Federation Press, 2010) 15; and in freshwater ecosystems as a result of changing human extraction practices, eg Capon, Samantha J et al, 'Riparian ecosystems in the 21st century: hotspots for climate change adaptation?' (2013) 16(3) *Ecosystems* 359, 360.

The primary criteria underpinning Australia's priorities for NRS expansion focus on developing a Comprehensive, Adequate, and Representative ('CAR') protected area network.[53] A rapidly growing body of research, including in Australia, has identified additional important criteria for developing protected area networks in the context of rapid climate change.[54] The most important of these, from an adaptation perspective, is the growing recognition that climate change should be explicitly acknowledged in protected area expansion and management.[55] McCormack and McDonald have summarised additional climate-critical criteria to include:

> increasing reserved areas along the southward (cooler) boundary, on steep environmental gradients, and areas of high altitude; reserving areas with high levels of heterogeneity, sensitivity and endemism, and those that incorporate landscape-scale ecological processes (floodplains, wetlands etc); and reserving multiple examples of a broad range of habitats, to increase representativeness and incorporate redundancy.[56]

There is also growing recognition in biodiversity conservation literature and government agency planning of the importance of 'climate refugia', in identifying new protected areas and for managing existing NRS properties.[57] Climate refugia are 'habitats that components of biodiversity can retreat to, persist in, and potentially expand from' as the climate changes,[58] avoiding 'episodes of mass mortality' and climate-driven extinction.[59] Local and regional differences in climate effects, caused when 'weather patterns and landscape

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[53] Commonwealth of Australia, *Australian Guidelines for Establishing the National Reserve System* (Environment Australia, 1999); and see Chapter 5.
[54] Eg using systematic conservation planning, Pressey R et al, 'Conservation Planning in a Changing World' (2007) 22(11) *Trends Ecol Evol* 583; Dunlop et al, above n 24; Taylor, MFJ, JA Fitzsimons and PS Sattler, *Building nature's safety net 2014: a decade of protected area achievements in Australia* (WWF Australia, 2014).
[55] Steffen et al, above n 39; McCormack and McDonald, above n 43.
[56] McCormack and McDonald, above n 43 and references cited therein.
[57] Eg Reside, April E et al, *Climate change refugia for terrestrial biodiversity: defining areas that promote species persistence and ecosystem resilience in the face of global climate change* (National Climate Change Adaptation Research Facility, 2013); Morelli, TL et al, 'Managing climate change refugia for climate adaptation' (2016) 11(8) *PLoS ONE* e0159909, 9; Lenoir, Jonathan, Tarek Hattab and Guillaume Pierre, 'Climatic microrefugia under anthropogenic climate change: implications for species redistribution' (2017) 40(2) *Ecography* 253.
[58] Reside, April E. et al, 'Characteristics of climate change refugia for Australian biodiversity' (2014) 39(8) *Austral Ecology* 887, 887.
[59] Hannah L, 'A global conservation system for climate-change adaptation' (2010) 24(1) *Conservation Biology* 70, 72, need national and international coordination; Ashcroft, Michael B, 'Identifying refugia from climate change' (2010) 37 *Journal of Biogeography* 1407, 1407.

features… act to amplify or dampen global patterns',[60] can be targeted in protected area planning to ensure that places that will experience comparatively smaller climate changes are conserved to support shifting and contracting species' ranges. While locating refugia in anticipation of major climate changes may be difficult,[61] the most important characteristics include high elevations and areas with significant diversity in slope, shade and hydrology.[62] These areas include mountainous regions, thick forest canopies or riparian corridors and groundwater seeps and springs in arid areas.[63] Most climate refugia on the Australian continent are located in south east and southern Australia and especially in Tasmania.[64]

The effectiveness of existing refugia for conserving biodiversity will depend on the rate and scale of local changes in climate, and species' capacity to relocate to those areas. Many Australian species have limited dispersal capacity – to shift their ranges independently at sufficient rate to outpace climate changes – and for some, existing climate refugia will be out of reach. For example, Reside and colleagues found that 'the closest temperature refugia for many upland species will be inaccessible, being hundreds, to thousands of kilometres to the south; and refugia for some of these species will simply not be present anywhere in continental Australia by 2085'.[65] Novel refugia may need to be constructed for these species and ecological communities, including in protected areas, to avoid extinctions and conserve ecological processes that are 'critical to human and non-human survival [but] have been degraded or lost in other places'.[66]

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[60] Reside et al, above n 57, 2.

[61] Lemieux, Christopher and Daniel Scott, 'Changing climate, challenging choices: identifying and evaluating climate change adaptation options for protected areas management in Ontario, Canada' (2011) 48(4) *Environmental Management* 675, 684.

[62] Reside et al, above n 57, 1; Ashcroft, above n 59.

[63] Ashcroft, above n 59; Reside et al, above n 58; Davis, Jenny et al, 'Evolutionary refugia and ecological refuges: key concepts for conserving Australian arid zone freshwater biodiversity under climate change' (2013) 19(7) *Global Change Biology* 1970.

[64] Reside et al, above n 57, 2.

[65] Ibid, finding that 'the closest temperature refugia for many upland species will be inaccessible, being hundreds, to thousands of kilometres to the south; and refugia for some of these species will simply not be present anywhere in continental Australia by 2085', and that 'there is a large portion of the Australian vertebrate community for which adequate natural refugia do not appear to exist', at 1, 2.

[66] McCormack and McDonald, above n 43, 120; constructing and/or conserving novel ecosystems to safeguard critical ecological functions will likely become important under climate change as crucial ecosystem services are lost, eg Hobbs R, 'Grieving for the past and hoping for the future: balancing polarizing perspectives in conservation and restoration' (2013) 21(2) *Restoration Ecology* 145.

3.3.2 Connectivity strategy - enhancing appropriate connectivity and landscape permeability

Changes in species' distributions and abundance are expected to be some of the most profound impacts of climate change, triggering 'shuffling' in the location, components, structure and function of ecological communities and ecosystems.[67] However, many of the landscapes that species will need to move within or across, to follow 'niche' temperature and rainfall conditions, are heavily fragmented.[68] Fragmented landscapes can impede adaptation under climate change by restricting shifts in species' ranges, but also by preventing gene flows, increasing sensitivity to extreme weather events, and reducing the health, function and adaptive capacity of fragmented species populations, habitats and ecosystems.[69] In response, the most commonly recommended biodiversity adaptation strategy is to increase and enhance landscape connectivity, particularly between protected area networks.[70]

Enhancing connectivity for climate adaptation will require maintaining or rehabilitating landscape 'connectedness' or linkages 'to facilitate species' movement as climate change triggers shifts in their ranges and preferred habitat'.[71] Connectivity more broadly has been promoted as a strategy to connect habitat patches, remnant vegetation and protected area networks across landscapes to maintain or restore the integrity of natural ecological

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[67] Chambers, LE, L Hughes and MA Weston, 'Climate change and its impact on Australia's avifauna' (2005) 105(1) *Emu* 1, 3-5; Pecl, Gretta T et al, 'Biodiversity redistribution under climate change: impacts on ecosystems and human well-being' (2017) 355(6332) *Science* eaai9214-1; Bonebrake, Timothy C et al, 'Managing consequences of climate-driven species redistribution requires integration of ecology, conservation and social science' (2017) 93(1) *Biological Reviews* 284.
[68] Steffen et al, above n 39.
[69] Laurance, WF et al, 'Averting biodiversity collapse in tropical forest protected areas' (2012) 489(7415) *Nature* 290; Lindenmayer D and Hobbs R (eds), *Managing and Designing Landscapes for Conservation: Moving from Perspectives to Principles* (Blackwell Publishing Ltd, 2007); IUCN, *Connectivity Conservation Project* <www.iucn.org/about/union/commissions/cem/cem_work/connectivity_conservation/>.
[70] Mawdsley, O'Malley and Ojima, above n 45, 1084; Heller and Zavaleta, above n 18, 18, 24; despite reservations about the limited evidence of success from existing projects, eg Hodgson, Jenny A et al, 'Climate change, connectivity and conservation decision making: back to basics' (2009) 46(5) *Journal of Applied Ecology* 964, in part because the strategy is still relatively new and effectiveness is not readily measured, Chester C and J Hilty, 'Connectivity Science' in GL Worboys, WL Francis and M Lockwood (eds) *Connectivity conservation management: a global guide* (Earthscan, 2010) 22, state that '[c]onnectivity conservation areas appear to be our best *comparatively reasonable* hope for protecting biodiversity in the long term' at 31, 33, emphasis added.
[71] McCormack and McDonald, above n 43, 124.

processes, and the health and function of ecosystems, and to overcome the ecological impacts of historical fragmentation.[72]

Increasing and enhancing connectivity is a large-scale strategy, usually pursued across multiple tenures at regional or continental scales.[73] Landscape connections – such as vegetation patches or 'stepping stones', movement corridors and remnant habitat within defined, target corridors – may be prioritised and protected under formal covenants and stewardship agreements, or through direct land acquisition.[74] Fragmented or degraded land between those patches and properties can then be prioritised for rehabilitation and regeneration investment, including by conservation NGOs such as Greening Australia, and/or through collaborative corridor governance arrangements.[75]

A climate adaptation-oriented approach to connectivity should emphasise biodiversity adaptation *in situ*, as well as facilitating independent migration.[76] Integrating the concept of climate refugia as a connectivity priority – to conserve, buffer and create refugia across corridors and habitats, as necessary – would support greater *in situ* adaptation opportunities. However, unlike the protected area strategy described above, connectivity conservation also focuses on improving the ecological health and function of landscapes

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[72] Worboys GL, WL Francis and M Lockwood (eds), *Connectivity conservation management: a global guide* (Earthscan, 2010) 4, 5-6; Hodgson et al, above n 70, 964; definitions of the concept of connectivity have been criticised for lacking specificity, eg Heller and Zavaleta, above n 18, 25; Scott and Lemieux, above n 45, 699; and Chester C and J Hilty, 'Connectivity Science' in Worboys et al, this footnote, 22-33.
[73] Worboys et al, above n 72, 5-6; Hannah, Lee et al, 'Protected area needs in a changing climate' (2007) 5(3) *Front Ecol Environ* 131, 137; Buckley, Ralf, 'World wild web: funding connectivity conservation under climate change' (2008) 9(3&4) *Biodiversity* 71, 72.
[74] Lausche, Barbara et al, *The legal aspects of connectivity conservation: a concept paper* (IUCN, 2013); Donald, Paul F and Andy D Evans, 'Habitat connectivity and matrix restoration: the wider implications of agri-environment schemes' (2006) 43 *Journal of Applied Ecology* 209; defining key target corridors for prioritised connectivity conservation funding was the goal of the now-shelved (and archived), Department of Sustainability, Environment, Water, Population and Communities, Commonwealth Government, *National Wildlife Corridors Plan: a framework for landscape-scale conservation* (2012) <http://155.187.2.69/biodiversity/wildlife-corridors/publications/pubs/national-wildlife-corridors-plan.pdf>.
[75] Whitten, Stuart et al *A compendium of existing and planned Australian wildlife corridor projects and initiatives, and case study analysis of operational experience* (Report prepared for the Australian Department of Sustainability, Environment, Water, Population and Communities, CSIRO Ecosystem Sciences, 2011).
[76] McCormack and McDonald, above n 43, 124-6; Bonebrake et al, above n 67.

more broadly; 'softening the matrix'[77] between protected areas by promoting sympathetic uses and management and creating buffer zones around existing protected areas.[78]

Landscape-scale connectivity will not, politically and practically, be achieved by expanding the public protected area estate.[79] As a result, greater engagement with private and indigenous landholders, and tools to support collaborative and adaptive management across private, public and indigenous tenures, are fundamental characteristics of the connectivity strategy. In this way, increasing and enhancing connectivity for adaptation can supplement adaptation within the protected area estate and potentially mitigate some of its shortfalls.[80] For example, connectivity projects are likely to be better placed to improve management and conservation of ecosystems commonly found on agricultural and other private land, such as native grasslands, which are currently poorly represented in the public protected area estate.[81] The connectivity strategy is also critical to climate adaptation in freshwater ecosystems, which are almost never contained wholly within protected area boundaries and are highly vulnerable to climate change.[82]

While well-connected and permeable landscapes may be crucial to whether some components of biodiversity survive as the climate changes, the value of these connections – like the value of climate refugia – '...depends on the availability of suitable habitats within [species'] transitional and final ranges and their ability to reach them'.[83] This will create particular challenges for Australian biodiversity, as the Australian landscape is relatively flat and sparse, with less than 1% of the continent above 1,000m elevation.[84]

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[77] The 'matrix' is defined as 'all unprotected land, across which land uses have major effects on protected areas and connectivity'; Brady MJ et al, 'Habitat attributes of landscape mosaics along a gradient of matrix development intensity: matrix management matters' (2009) 24(7) *Landscape Ecology* 879.
[78] Hannah, Lee and Lara Hansen, 'Designing landscapes and seascapes for change' in Thomas E Lovejoy and Lee Hannah (eds), *Climate change and biodiversity* (Yale University Press, 2005); Donald and Evans, above n 74, 212, 214.
[79] Buckley, above n 73, 71.
[80] Worboys, Francis and Lockwood, above n 72, 7.
[81] McCormack and McDonald, above n 43, '…participation by private landholders will be particularly important as the availability of high quality land for public conservation purposes declines… and [as] landscape values and processes are altered and further fragmented', at 125.
[82] Eg Capon et al, above n 52.
[83] McCormack and McDonald, above n 43, 124.
[84] Australian Bureau of Statistics, *Yearbook 2012* (2012) <www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1301.0~2012~Main%20Features~Geography%20of%20Australia~12>; leaving aside the issue that species that *can* shift their ranges will do so at different

In some cases, connectivity will not only fail to promote adaptation, but may actually present a risk greater to biodiversity than climate change.[85] For example, connecting historically isolated habitat patches may increase the risk of introducing harmful pathogens and invasive species to new areas[86] and increase the scale of damage from bushfires.[87] As a result, a key characteristic of enhancing connectivity for climate adaptation must be the option of *limiting* connectivity where necessary.[88]

3.3.3 Non-climatic stressors strategy – removing or reducing the effect of existing biodiversity stressors

A wide variety of historical and ongoing non-climatic stressors currently threaten Australia's biodiversity. Stressors range from global in scale, such as dramatic growth in global markets and rapid international movement of goods, to regional and local scales, such as land use changes, pollution and inappropriate fire regimes.[89] Historical stressors continue to threaten biodiversity. For example, despite stabilising rates of land clearing across most of Australia, the legacy of centuries of clearing and habitat fragmentation remains one of the most significant existing biodiversity stressors.[90] Other major current stressors include the impacts of pest species and pathogens, changing hydrology and overexploitation of natural resources,[91] while emerging stressors include a growth in micro-pollutants, large-scale functional shifts in soils and, of course, climate change.[92] Non-climatic stressors on biodiversity interact and their cumulative effect increases the

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rates, breaking down critical co-evolved interactions and placing species and broader ecological communities at greater risk of collapse, Hughes, Lesley, 'Can Australian biodiversity adapt to climate change?' in Daniel Lunney and Pat Hutchings (eds), *Wildlife and climate change: towards robust conservation strategies for Australian fauna* (Royal Zoological Society of NSW, 2012) 8.

[85] Haddad, Nick M et al, 'Potential negative ecological effects of corridors' (2014) 28(5) *Conserv Biol* 1178.

[86] Prober S and M Dunlop, 'Climate change: a cause for new biodiversity conservation objectives but let's not throw the baby out with the bathwater' (2011) 12(1) *Ecological Management & Restoration* 2, 3.

[87] Ibid; Scott and Lemieux, above n 45; Heller and Zavaleta, above n 18; Steffen et al, above n 39.

[88] McCormack and McDonald, above n 43, 125-6; Steffen et al, above n 39; including to promote active experimentation in adaptive management techniques, Prober and Dunlop, above n 86, 3.

[89] Cresswell ID and HT Murphy, *Australia State of the Environment 2016: Biodiversity* (Independent report to the Minister for the Environment and Energy, Commonwealth Government, 2017) <https://soe.environment.gov.au/theme/biodiversity> ('SotE 2016').

[90] Ibid 22-3, habitat loss is a threat to more than half of all nationally-listed threatened species; and fragmented woodland systems have more invasive species, at 36.

[91] Ibid 8, 38; each of which have direct, indirect and cumulative effects on species and ecosystems; invasive species and pathogens are listed as a threat to nearly 80% of nationally-listed threatened species, 60% are threatened by fire and fire suppression, 52% are threatened by agriculture/aquaculture, and 46% are threatened by human intrusion and disturbance, at 9.

[92] Ibid.

vulnerability of species and ecosystems to new stressors, including climate change. As a result, removing or reducing non-climatic stressors is widely recognised as a critical strategy for improving biodiversity adaptation under climate change.[93]

While most direct impacts of climate change will not be avoided by reducing non-climate stressors, this adaptation strategy is promoted as a way of helping species and ecosystems to cope with at least some level of climate impact, including those impacts that are, as yet, unknown.[94] As such, reducing the effect of stressors such as land clearing, feral predators and invasive weed species, is often described as a 'no regrets' management approach. No regrets management can often be implemented immediately and, 'regardless of actual climate change impacts …will reduce the toxicity of the environment, improve human health, and contribute to sustainability'.[95]

As the climate changes, a clear commitment to reducing the impact of existing stressors on biodiversity, along with greater resourcing and enforcement of existing legal and policy frameworks, will be fundamental to implementing this adaptation strategy. Climate change will also require new management approaches, including responding to native species becoming invasive;[96] non-native species playing beneficial ecosystem roles;[97] and management actions that are designed to control or remove a non-climatic stressor resulting in complex, unexpected and potentially harmful effects to other biodiversity.[98]

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[93] Heller and Zavaleta, above n 18, 18 and references cited therein, Mawdsley, O'Malley and Ojima, above n 45; Australian Department of the Environment, Water, Heritage and the Arts, *Assessment of Australia's Terrestrial Biodiversity 2008* (Report prepared by the Biodiversity Assessment Working Group of the National Land and Water Resources Audit for the Australian Government, 2009) 150-1.
[94] Lindenmayer, David B et al, 'Conservation strategies in response to rapid climate change: Australia as a case study' (2010) 143(7) *Biological Conservation* 1587.
[95] Craig, above n 37, 42-3.
[96] Eg Haythorpe, Kathryn M, Darren Burke and Danielle Sulikowski, 'The native versus alien dichotomy: relative impact of native noisy miners and introduced common mynas' (2013) *Biological Invasions* 1.
[97] Eg Rogalski, Mary Alta and David Kiernan Skelly, 'Positive effects of nonnative invasive Phragmites Australis on larval bullfrogs' (2012) 7(8) *PLoS ONE* e44420.
[98] eg. Walsh, JC et al, 'Unexpected outcomes of invasive predator control: the importance of evaluating conservation management actions' (2012) 15(4) *Animal Conservation* 319; Lindenmayer, DB, 'Continental-level biodiversity collapse' (2015) 112(15) *Proceedings of the National Academy of Science USA* 4514.

3.3.4 Ex situ strategy – improving the use of ex situ conservation for biodiversity adaptation

Low intensity, place-based conservation strategies such as increasing the NRS will be insufficient to conserve biodiversity with limited adaptive capacity or that is exposed to high rates of climate-induced environmental change.[99] To facilitate adaptation and limit increasing extinction rates under climate change, proactive intervention to conserve species and assemblages outside their historical ranges will sometimes be necessary, an approach known as *ex situ* or ‘off-site’ conservation.[100] Planned, human intervention will be particularly important for biodiversity located in habitats and microclimates that will no longer exist in coming decades,[101] including species such as the Mountain Pygmy-possum (*Burramys parvus*)[102] and ecosystems such as cloud forests[103] that are located at the top of mountains and unable to migrate to higher altitudes to reach cooler climates. Biodiversity with the capacity to migrate to follow shifting climate niches will also be at risk of extinction when faced with natural barriers to migration such as deserts or oceans, or anthropogenic barriers such as cities or regions heavily fragmented by agriculture.[104] Planned intervention will also be necessary to relocate those species that are unable to adapt their behaviour or genetics fast enough to survive rapid climate changes *in situ*, or that have limited-dispersal capacity, such as long-lived trees, lichens and some invertebrates.[105]

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[99] McCormack and McDonald, above n 43; Figure 3.1.
[100] *Ex situ* conservation is defined in the Convention on Biological Diversity as the ‘conservation of components of biological diversity outside their natural habitats’, *Convention on Biological Diversity*, opened for signature 5 June 1992, 1760 UNTS 79 (entered into force 29 December 1993) (‘CBD’), Art 2; the Latin ‘*ex situ*’ is variously defined as ‘off-site’, ‘out of nature’ or ‘out of place’, Braverman, Irus, ‘Conservation without nature: the trouble with in situ versus ex situ conservation’ (2014) 51 *Geoforum* 47; Braverman, Irus, ‘Captive for life: conserving extinct in the wild species through ex situ breeding’ in Lori Gruen (ed), *The ethics of captivity* (Oxford University Press, 2014) 193.
[101] Dunlop et al, above n 24, 21-2; Reside et al, above n 57, 2.
[102] Eg Pickering C, R Good and K Green, *Potential effects of global warming on the biota of the Australian Alps* (Technical report to the Australian Greenhouse Office, 2004).
[103] Eg Still, Christopher J, Prudence N Foster and Stephen H Schneider, ‘Simulating the effects of climate change on tropical montane cloud forests’ (1999) 398(6728) *Nature* 608.
[104] McCormack and McDonald, above n 43, 130; Hoegh-Guldberg, O et al, ‘Assisted colonization and rapid climate change’ (2008) 321(5887) *Science* 345, 345-6; Schloss, Carrie A, Tristan A Nuñez and Joshua J Lawler, ‘Dispersal will limit ability of mammals to track climate change in the Western Hemisphere’ (2012) 109(22) *Proceedings of the National Academy of Sciences* 8606, 8606.
[105] Heller and Zavaleta, above n 18, 25; Schloss et al, above n 104, 8606; Lawler, Joshua J and Julian D Olden, ‘Reframing the debate over assisted colonization’ (2011) 9(10) *Frontiers in Ecology and the*

Ex situ conservation is an overarching concept that covers a broad range of interventions, engages a range of different legal frameworks,[106] and raises a variety of practical, financial, ethical and legal issues.[107] *Ex situ* conservation has traditionally been considered an option either of last resort[108] or purely as a supporting measure for *in situ* conservation,[109] but nevertheless makes a small but significant contribution to current global conservation efforts.[110] A range of different bodies participate in *ex situ* conservation programs, including public agencies, international, national and local NGOs and individuals and collaborative public/private partnerships.[111] *Ex situ* programs include the operation of zoological and botanical gardens, aquaria, captive breeding and seed bank storage programs, and cloning and gene banks. However, the emphasis of traditional conservation on wild biodiversity, conserved *in situ* or 'in nature', has meant that conservation efforts in captivity have rarely been integrated with *in situ* efforts;[112] and *ex situ* populations are sometimes explicitly categorised as 'non-conserved'.[113]

Conservation and adaptation researchers have only recently begun contemplating *ex situ* conservation objectives that target ecological communities and ecosystem processes as

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Environment 569, 569; Root, Terry L et al, 'Fingerprints of global warming on wild animals and plants' (2003) 421 *Nature* 57.

[106] Such as law and policy for conservation, land use planning, biosecurity, weed and pest animals, hunting and other natural resource management frameworks, McCormack & McDonald, above n 43.

[107] Including ethical and legal issues with controlling genetic research, intellectual property rights, trade in endangered species, and the role of NGOs and private actors in undertaking, and agreeing on priorities for, *ex situ* conservation measures, McCormack and McDonald, above n 43, 135-6.

[108] The CBD *Preamble* states that '…the fundamental requirement for the conservation of biodiversity is the in-situ conservation of ecosystems and natural habitats and the maintenance and recovery of …species in their natural surroundings', above n 100; Maunder M and O Byers, 'The IUCN Technical Guidelines on the Management of Ex Situ Populations for Conservation: reflecting major changes in the application of *ex situ* conservation' (2005) 39(1) *Oryx* 95.

[109] CBD Art 9, above n 100, eg Art 9(d) requires state parties to '[r]egulate and manage collection of biological resources from natural habitats for ex-situ conservation purposes so as not to threaten ecosystems and in-situ populations of species, except where special temporary ex-situ measures are required'; *cf* Maunder and Byers, above n 108, 95, arguing the 'need for integrated management of wild and captive populations'.

[110] Fa JE et al, 'Zoos on full conservation potential' (2014) 17 *Animal Conservation* 97.

[111] Eg Mawson, Peter R, 'Translocations and fauna reconstruction sites: *Western Shield* review—February 2003' (2004) 5(2) *Conservation Science W Aust* 108; Taronga Zoo, 'Conservation partnerships' <https://taronga.org.au/conservation/conservation-partnerships>; Svalbard Global Seed Vault <https://www.croptrust.org/our-work/svalbard-global-seed-vault/>.

[112] Braverman, 'Conservation with nature', above n 100; Braverman 'Captive for life', above n 100; *cf* Conde, Dalia A et al, 'Opportunities and costs for preventing vertebrate extinctions' (2015) 25(6) *Current Biology* R219; IUCN One Plan Approach <www.cbsg.org/institutional-application-one-plan-approach>.

[113] Eg *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 179(2), a species may be listed as 'extinct in the wild' if, among other things, '(a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range…'.

well as population-specific targets.[114] Ecosystem-oriented *ex situ* conservation may include managed relocation of species assemblages and ecological communities outside their historical distribution; rewilding projects that construct novel ecosystems or familiar ecosystems in new locations; and the process of introducing one or many non-native species populations into an ecosystem as ecological replacements for now-extinct keystone species.[115]

Improving the use of *ex situ* measures for biodiversity adaptation will include a broad range of management actions, from translocating species populations across short distances to increase their genetic diversity and adaptive capacity,[116] through to preserving genetic material in gene banks and museums.[117] As climate change triggers changes to species abundance and distributions, and the health, structure and location of habitats and ecosystems, Pritchard and Harrop argue that:

> [*Ex*] *situ* strategies can no longer be regarded as mere support mechanisms for *in situ* conservation but [should be understood] rather as a crucial means in themselves to fulfil a wider and integrated mission to preserve global biodiversity.[118]

Ex situ measures will play an important role in facilitating biodiversity adaptation, including ecological transition and even transformation under climate change. In the short term, *ex situ* management for adaptation may support '…the temporary restoration of ecosystem services, wildlife corridors and general amenity'.[119] However, future *ex situ*

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[114] See discussion in McCormack, Phillipa C, 'Conservation introductions for biodiversity adaptation under climate change' (2018) (first view) *Transnational Environmental Law* 1; Lunt, Ian et al, 'Using assisted colonisation to conserve biodiversity and restore ecosystem function under climate change' (2013) 157 *Biological Conservation* 172.

[115] Seddon, Philip J et al, 'Reversing defaunation: restoring species in a changing world' (2014) 345(6195) *Science* 406; Hobbs, Richard J et al, 'Intervention ecology: applying ecological science in the twenty-first century' (2011) 61(6) *BioScience* 442; Sansilvestri, Roxane, Nathalie Farascaria-Lacoste and Juan F. Fernández-Manjarre´s, 'Reconstructing a deconstructed concept: policy tools for implementing assisted migration for species and ecosystem management' (2015) 51 *Environmental Science & Policy* 192.

[116] International Union for the Conservation of Nature/Species Survival Commission, *Guidelines for reintroductions and other conservation translocations: version 1.0* (IUCN, 2013) ('IUCN Guidelines 2013') 3; Weeks, Andrew R et al, 'Genetic rescue increases fitness and aids rapid recovery of an endangered marsupial population' (2017) 8(1) *Nature Communications* 1071.

[117] Eg Conde, D. A. et al, 'Zoos through the lens of the IUCN Red List: a global metapopulation approach to support conservation breeding programs' (2013) 8(12) *PLoS ONE* e80311.

[118] Pritchard, Diana J and Stuart R Harrop, 'A re-evaluation of the role of ex situ conservation in the face of climate change' (2010) 7(1) *BGJournal* 1, 3.

[119] Harris, Stephen et al, 'Whose backyard? Some precautions in choosing recipient sites for assisted colonisation of Australian plants and animals' (2013) 14(2) *Ecological Management & Restoration* 106, 123.

measures are likely to be directed to more permanent and controversial approaches[120] such as introducing species and ecological communities outside their historical ranges to avoid climate-induced extinction – known as managed relocation[121] – and introducing non-native organisms to replace extinct native organisms and restore critical ecosystem processes and functions – known as ecological replacement.[122] Managed relocation and ecological replacement, together, 'conservation introductions', are defined by the International Union for the Conservation of Nature ('IUCN') as 'the intentional movement and release of an organism outside its indigenous range'.[123] Conservation introductions have been adopted as the focus of the *ex situ* strategy in this thesis because they are increasingly important adaptation-oriented conservation responses but poorly represented in existing legal frameworks. They also clearly demonstrate the way that adaptation strategies can place traditional conservation law purposes in conflict, such as avoiding species extinctions per se and conserving biodiversity *in situ*, which cannot both be achieved as niche climate conditions shift and change as the climate changes.[124]

Conservation introductions are directed at pre-empting climate-related extinction and biodiversity decline, but are controversial.[125] Major concerns about conservation introductions include the ethics of 'playing God' with nature;[126] the high level of risk to both receiving environments and the target organisms for relocation;[127] a relatively high

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[120] McCormack, above n 114.
[121] Managed relocation focuses on species-specific conservation, see Chapter 8; McLachlan and colleagues argue that '[i]f circumventing climate-driven extinction is a conservation priority, then assisted migration must be considered a management option', McLachlan J S et al, 'A framework for debate of assisted migration in an era of climate change' (2007) 21(2) *Conserv Biol* 297, 297.
[122] Ecological replacements are targeted at habitat- and ecosystem-scale conservation, introducing species or assemblages outside their historical range to replace an ecologically similar 'native-but-now-extinct' species or assemblage, 'to restore lost ecological function and prevent ecosystems from crossing thresholds into new, less desirable states', McCormack, above n 114; Seddon PJ, 'From reintroduction to assisted colonization: moving along the conservation translocation spectrum' (2010) 18(6) *Restoration Ecology* 796, 798.
[123] IUCN Guidelines 2013, 3.
[124] McLachlan et al, above n 121, 297; Richardson D M et al, 'Multidimensional evaluation of managed relocation' (2009) 106(24) *Proceedings of the National Academy of Science USA* 9721, 9722-3; and see Chapter 8.
[125] Eg Hoegh-Guldberg et al, above n 104; Schwartz, Mark W et al, 'Managed relocation: integrating the scientific, regulatory, and ethical challenges' (2012) 62(8) *BioScience* 732.
[126] Minteer, Ben A and James P Collins, 'Move it or lose it? The ecological ethics of relocating species under climate change' (2010) 20(7) *Ecological Applications* 1801; Sandler, R, 'The value of species and the ethical foundations of assisted colonization' (2010) 24(2) *Conserv Biol* 424; Schwartz et al, above n 125.
[127] Ricciardi, A and D Simberloff, 'Assisted colonization is not a viable conservation strategy' (2009) 24(5) *Trends Ecol Evol* 248; Schwartz et al, above n 125; Xu, Han et al, 'Intentionally introduced species: more easily invited than removed' (2014) 23(10) *Biodiversity and Conservation* 2637.

risk of failure;[128] concerns about limited information and high levels of uncertainty; and the risk of diverting resources from other adaptation strategies that are better understood, less risky, and more cost-effective.[129]

This final adaptation strategy, to improve the use of *ex situ* measures and especially managed relocations and ecological replacements, requires striking a balance between the relative risks of preserving the status quo and intervening to relocate organisms outside historical ranges.[130] Balancing competing considerations is already a challenging task for conservation decision makers, and will only become more complex as climate change turns species and ecosystems into 'moving targets'.[131]

3.4 Conclusion

Addressing growing extinction rates and the risk of ecosystem collapse under climate change will require greater engagement with high-intensity conservation strategies such as conservation introductions, and new ways of deploying lower-intensity strategies such as increasing the size of the NRS.[132] Climate change is already triggering a need to reconsider the historical role of *ex situ* conservation as primarily complementing *in situ* measures.[133] There is also a clear need for greater commitment and resourcing for reducing the effect of non-climatic stressors on biodiversity, to address historical and ongoing vulnerability to existing stressors, but also to enhance the adaptive capacity of species and ecological communities to ensure their survival as the climate changes.

The strategies discussed above have been proposed as critical for facilitating biodiversity adaptation as the climate changes – either to guide incremental transitions, or manage

[128] Eg Fischer, J and DB Lindenmayer, 'An assessment of the published results of animal relocations' (2000) 96 *Biological Conservation* 1, 8; Mawdsley, O'Malley and Ojima, n 45, 1087.
[129] Ricciardi, Anthony and Daniel Simberloff, 'Assisted colonization: good intentions and dubious risk assessment' (2009) 24(9) *Trends in Ecology & Evolution* 476; Seddon, Philip J et al, 'The risks of assisted colonization' (2009) 23(4) *Conservation Biology* 788; though there is limited information about actual costs, eg Fischer and Lindenmayer's review of 180 relocation case studies found only six reported the costs involved, above n 128, 5.
[130] Hoegh-Guldberg et al, above n 104, 346.
[131] McCormack and McDonald, above n 43; Lawler and Olden, above n 105, 570.
[132] McCormack and McDonald, above n 43, 118; Steffen et al, above n 39.
[133] Pritchard and Harrop, above n 118, 1, 2-3.

inevitable ecological transformations.[134] While the focus of these strategies is on planned adaptation, each strategy also has the capacity to support to independent adaptation, for example, by providing future habitat in protected areas to respond to climate-driven species redistributions, and by enhancing ecosystem functioning despite rapid changes, through the use of ecological replacements. However, responding to climate impacts will involve 'both rapid directional change and tremendous uncertainty',[135] so no single strategy will be able to deliver adaptation outcomes across every component of biodiversity, or temporal and spatial scale.[136] The next chapter takes a step back from these strategies, highlighting the challenge that climate change represents for conservation laws more broadly.

[134] Heller and Zavaleta, above n 18, 27; Hulme, Philip E, 'Adapting to climate change: is there scope for ecological management in the face of a global threat?' (2005) 42(5) *Journal of Applied Ecology* 784.
[135] Heller and Zavaleta, above n 18, 27.
[136] Mawdsley, O'Malley and Ojima, above n 45, 1087.

Chapter 4 Adaptation-oriented purposes and principles in legal frameworks

Parts of this chapter will be published in Phillipa C McCormack, ‘The legislative challenge of facilitating climate change adaptation for biodiversity’ (2018) 92 *Australian Law Journal* (forthcoming), and included in this chapter with the acknowledgment of the publisher, Thomson Reuters.

4.1 Introduction

This chapter considers the status of legal frameworks for conservation. It builds on the implications of climate change for Australian biodiversity, described in Chapter 1, and the discussion of adaptation strategies to respond to that challenge, in Chapter 3. In keeping with the thesis methodology described in Chapter 2, this chapter takes both a doctrinal and non-doctrinal approach. The analysis that follows draws on conservation legislation, case law and key conservation policies, as well as scientific and legal scholarship and stakeholder interviews, to highlight challenges and opportunities for biodiversity adaptation that arise from the purposes and design of legal frameworks for conservation.

There is growing scientific consensus that the goal of preventing all extinctions, or conserving all native species *in situ*, will be unachievable as the climate changes.[1] A legal framework that emphasises preservation by reference to historical baselines could both hinder current efforts at adaptive conservation and undermine future legal reforms, including those proposed in this thesis, to facilitate adaptation.

The first part of this chapter, Section 4.2, identifies *what*, in a general sense, conservation laws and policies are currently designed to achieve, that is, the ‘purposes’ that underpin legal frameworks for conservation. This task is a challenging one because many legal and policy purposes are not articulated clearly or directed to specific outcomes. Section 4.2 highlights key strengths and weaknesses of these legal and policy purposes from the perspective of climate change adaptation, and investigates the way that conservation paradigms underpinning legal frameworks may impede biodiversity adaptation.

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[1] Steffen, W et al, *Australia’s biodiversity and climate change: a strategic assessment of the vulnerability of Australia’s biodiversity to climate change* (Biodiversity and Natural Resource Management Adaptation Team, Commonwealth Department of Climate Change, 2009); Dunlop, Michael et al, *Climate-ready conservation objectives: a scoping study* (National Climate Change Adaptation Research Facility, 2013).

Section 4.3 then investigates *how* legal frameworks for conservation more broadly should be designed to achieve more adaptive conservation laws and policies under climate change. In assessing the design of future legal frameworks, this part acknowledges that conservation laws and policies will almost certainly continue to focus on preserving threatened species and spatially-fixed protected areas, at least in the short term. With that in mind, Section 4.3 articulates three legal design principles for improving legal frameworks for conservation, which are used in this thesis.

Interpreting and applying conservation law and policy purposes under climate change is an inherently values-driven process. Similarly, designing new purpose clauses for conservation legislation involves normative questions about how society values different components and assemblages of biodiversity;[2] the desirability of particular conservation interventions; and how responsibility for achieving conservation outcomes should be allocated and funded.[3] Reforming the purpose and design of legal frameworks for conservation must involve extensive engagement with Australian communities at local, regional and national scales, and across sectors. The complexity of conducting a national conversation of this kind will be a significant challenge for politicians, government agencies and Australian legislatures, particularly given ongoing, heated, and arguably unhelpful, binary political debates about conserving or developing Australia's natural assets.[4] This chapter acknowledges the need for that broad engagement and offers two contributions: first, a detailed analysis of the current status of legal frameworks for conservation, to inform future engagement on the issue; and second, a framework for the substantive legal analysis and design recommendations that follow, for each of the adaptation strategies, in Chapters 5 to 8.

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[2] Dunlop et al, above n 1, 3, 17.
[3] Eg Rolston III, Holmes, 'In situ and ex situ conservation: philosophical and ethical concerns' in Edward O Guerrant Jr, Kayri Havens and Mike Maunder (eds), *Ex situ plant conservation: supporting species survival in the wild* (Island Press, 2004) 21.
[4] Debus, B, *All living things are diminished: breaking the national consensus on the environment* (The Whitlam Institute, University of Western Sydney, Parramatta, 2014).

4.2 Conservation purposes in legal frameworks

Explicit statements of 'legal purpose' are common in modern environmental legislation, typically in the form of objects clauses.[5] In this thesis, the terms 'legislative purpose' and 'legal purpose' are used broadly to describe the explicit and implicit outcomes and processes that conservation legislation is intended to achieve. Legal purposes include:

- overarching environmental *goals*, such as sustainable development;
- explicit *objects clauses* in legislation that are intended to identify the broad purposes of a statute;[6]
- implicit purposes or *paradigms* which are demonstrated by analysing the way that objects clauses are operationalised in law and policy;[7]
- prescriptive rules, standards or *principles* that guide decision making; and
- specific, measurable *objectives* that identify the intended outcome of a particular legal mechanism or process.[8]

The policy purposes most significant to this thesis are those that interpret and/or operationalise legal purposes for biodiversity conservation. For example, the Tasmanian government's *Natural Heritage Strategy for Tasmania (2013-2030)* collates and explains the broad range of statutory objects and obligations from all relevant state legislation, to guide decision making about 'natural heritage' in the state.[9] Other policy instruments are more targeted, such as the NSW *Saving our Species* program, which operationalises

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[5] *Hastings PT Progress Association v Tweed Shire Council* 168 LGERA 99, [60] per Basten JA; though terminology varies, eg purpose clauses are referred to as 'objectives' in the *Threatened Species Protection Act 1995* (Tas), 'objects' in the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and 'purposes' in the *Biodiversity Conservation Act 2016* (NSW), and used inconsistently in grey literature and academic scholarship eg McGrath, Chris, 'The role played by policy objectives in environmental law' in Douglas E Fisher (ed), *Research handbook on fundamental concepts of environmental law* (Edward Elgar Publishing, 2016) 369, 370; *cf* Australian Panel of Experts on Environmental Law ('APEEL'), *The foundations of environmental law: goals, objects, principles and norms* (Technical paper 1, 2017) 3-6.
[6] Although, in practice, these clauses tend not to specify outcomes expected from conservation laws and policies.
[7] Which are apparent in the way that legislation and policy are interpreted and implemented, Section 4.2.3.
[8] Generally adopting the terminology defined in APEEL, above n 5, 5.
[9] Tasmanian Department of Primary Industries, Parks, Water and the Environment ('DPIPWE'), *Natural Heritage Strategy for Tasmania (2013-2030)* (2013).

objects clauses and substantive provisions from NSW legislation specifically for conserving threatened species.[10] Similarly, international, national and state legal purposes about conserving ecosystems and protected areas are primarily implemented through *Australia's Strategy for the National Reserve System 2009-2030* ('NRS Strategy'), which also guides public and private investment in protected area conservation priorities.[11]

4.2.1 Sources of legal and policy purposes and their role in legal frameworks for conservation

Legal and policy purposes often reflect the goals of international conservation conventions and agreements to which Australia is a party, such as the Convention on Biological Diversity.[12] In Australia, the sources of legal and policy purposes for conservation include federal and state legislation,[13] Commonwealth and state government strategies, policies and programs;[14] regionally-administered legislation and strategies;[15] and local-scale planning schemes and policies[16] (Figure 4.2).

Legal purposes are also expressed in statutory guidance for decision making,[17] including in directing principles such as the precautionary principle and the Australian International Union for the Conservation of Nature ('IUCN') reserve management principles,[18] and in

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[10] NSW Office of Environment and Heritage, *More plants and animals to be saved from extinction: Saving our Species 2016–21* (2016).
[11] Also including *Australia's Biodiversity Conservation Strategy 2010-2030* (Australian Government, 2010), *Australian Government's Threatened Species Strategy* and associated *Action Plan 2015-16* (Australian Government, 2015) <http://www.environment.gov.au/biodiversity/threatened/publications/factsheet-threatened-species-strategy-action-plan-2015-16-20-mammals-by-2020>; and state equivalents.
[12] *Convention on Biological Diversity*, opened for signature 5 June 1992, 1760 UNTS 79 (entered into force 29 December 1993) ('CBD'); action under the CBD is also to be guided by the *Strategic Plan for Biodiversity 2011–2020* and the 'Aichi Biodiversity Targets', adopted by the Conference of the Parties ('COP') to the CBD, *Decision of the COP in its Tenth Meeting, Held in Nagoya from 18-29 October 2010 – Agenda item 4.4*, UN Doc UNEP/CBD/COP/DEC/X/2 (29 October 2010).
[13] EPBC Act; eg *Biodiversity Conservation Act 2016* (WA), *Nature Conservation Act 2014* (ACT), *Nature Conservation Act 1992* (Qld), and split regimes in *Flora and Fauna Guarantee Act 1988* (Vic) and *National Parks Act 1975* (Vic), and the *Threatened Species Protection Act 1995* (Tas), *Nature Conservation Act 2002* (Tas) and *National Parks and Reserves Management Act 2002* (Tas).
[14] Above nn 9-11.
[15] Eg *Catchment and Land Protection Act 1994* (Vic); NRM South, 'Strategies, plans and reports' (2017) <https://www.nrmsouth.org.au/resources/strategies-plans-reports/>.
[16] Eg Wodonga Local Government Area, *Planning Scheme* (2017) <http://planning-schemes.delwp.vic.gov.au/schemes/wodonga> and Kingborough City Council, *Kingborough Interim Planning Scheme* (2015) <https://www.kingborough.tas.gov.au/development/planning/>.
[17] Eg *National Parks Act 1975* (Vic) s 17(2)(a)(i).
[18] Environment Protection and Biodiversity Conservation Regulations 2000, Sch 8.

eligibility criteria for threatened species listings.[19] Legal purposes are represented in statutory planning instruments, guiding the development of site-specific, species-specific, and 'on ground' management activities. Statutory planning instruments include protected area management plans, threatened species or ecological community recovery plans, and threat abatement plans. For example, the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) ('EPBC Act') object clause about protecting native species and preventing extinctions underpins the Act's processes for threatened species and communities listing[20] which, in turn, determines whether the Commonwealth Environment Minister must prepare an approved conservation advice or species recovery plan with guidance on immediate species recovery and threat abatement activities.[21] Conservation agreements and covenants with private landholders may also specify the conservation purposes that apply to managing biodiversity on a specific parcel of land.

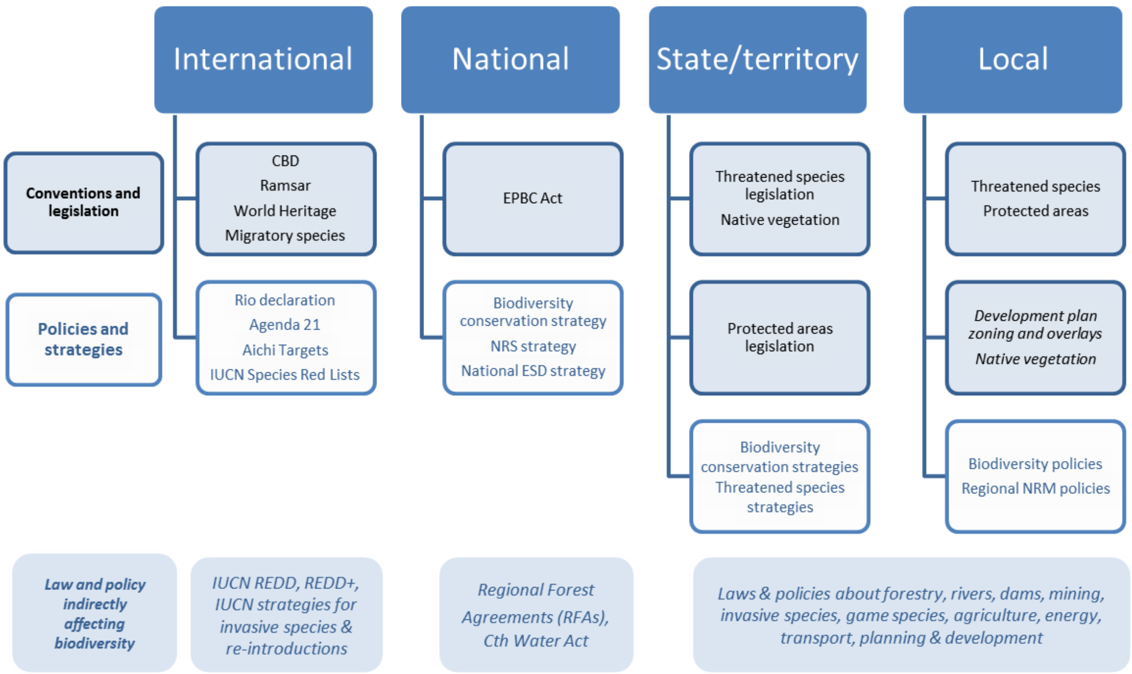

Figure 4.1 International and Australian sources of conservation purposes in legal frameworks

[19] Eg *Flora and Fauna Guarantee Act 1988* (Vic) s 11, 'a taxon or community of flora or fauna is eligible to be listed if it is in a demonstrable state of decline which is likely to result in extinction…'.
[20] EPBC Act s 194A.
[21] EPBC Act s 266B.

Legal purposes play a range of roles in biodiversity conservation in Australia. From a practical perspective, legal purposes are important for informing judicial interpretation of substantive and procedural legal obligations.[22] For example, objects clauses can help 'to resolve any uncertainty or ambiguity in the operative provisions' of a statute,[23] and may be the factor on which a judicial decision turns.[24] Legal purposes also guide conservation planning and practice by:

- influencing agency priority setting and decision making;[25]
- communicating, in clear terms and for the benefit of the broader community, what a piece of legislation aims to achieve;[26]
- reflecting and informing the many different ways that society values the environment;[27] and
- providing criteria for evaluating the success or otherwise of conservation policies and programs, including implementation of conservation laws.[28]

Interview participants for this research had different ideas about the role of object clauses in legislation. Most commonly, participants described legal purposes as representing some form of 'compact' between government and the community about how nature is valued.[29]

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[22] Eg *Acts Interpretation Act 1901* (Cth) s 15AA; failing to take a mandatory consideration – including a statement of purpose – into account is an administrative error that can be challenged or appealed, even if the standard for taking something into account is very low, *Plumb v Penrith City Council and Anor* [2002] NSWLEC 223, [36], per Pearlman J.
[23] Pearce DC and RS Geddes, *Statutory Interpretation in Australia* (LexisNexis, 8th ed, 2014) [4.49]; Preston, Hon Justice Brian J, 'Protected areas in the courts: an overview' (Paper presented at the IUCN World Parks Congress, Sydney, 13 November 2014); *cf* McGrath, above n 5, some judges who prefer pure textual analysis in statutory interpretation, 'tend to place little value on objects clauses even where, ironically, these are expressly included in the text', at 371, 380, 382.
[24] Preston, above n 23.
[25] Eg Council of Australian Governments, *Intergovernmental Agreement on the Environment* (1 May 1992) cl 3.5, '…the principles set out below should inform policy making and program implementation…', including the precautionary principle and the principle of conserving biological diversity and ecological integrity.
[26] McGrath, above n 5, 380.
[27] Hagerman, Shannon et al, 'Expert views on biodiversity conservation in an era of climate change' (2010) 20(1) *Global Environmental Change* 192, 194; Dunlop et al, above n 1, 3.
[28] Tear, Timothy H et al, 'How much is enough? The recurrent problem of setting measurable objectives in conservation' (2005) 55(10) *BioScience* 835, 835; McGrath, above n 5, 382-3.
[29] Interviews #1 (government), #3 (government), #6 (advocacy/NGO), #7 (government), #29 (government), #30 (advocacy/NGO); but on declining trust in public policy makers, #6, #7 and #30.

Some participants described conservation objects clauses as playing a ‘balancing’ role, ensuring that conservation outcomes are balanced against pure economic considerations in decision making about natural resource uses.[30] One government participant questioned whether the values expressed in legislation may now be out-of-date or, at least, that perhaps citizens no longer understand ‘*why* the values expressed in legislation are important’.[31] An analysis of the extensive and diverse scholarship about valuing nature is beyond the scope of this thesis. However, this finding highlights a potential gap in shared understandings about environmental values that will need to be overcome in legal reform processes. Rapid, ongoing social and environmental change may otherwise erode any remaining consensus on this issue.

The importance of legal purposes for most conservation activities should not be overstated. Principles of statutory interpretation give primary emphasis to the words of substantive legislative provisions being applied, and considering legal purposes such as objects clauses may not provide any additional clarity.[32] Further, legal purposes are not the most significant barrier to climate adaptation in conservation laws, nor are they the most significant weakness in laws for conserving biodiversity, more generally.[33] Legal purposes nevertheless provide an important starting point for considering the broader question of how Commonwealth and state legislatures can best respond to the challenges that climate change represents for Australia’s legal frameworks for biodiversity conservation.

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[30] And, in most cases, emphasising a failure to achieve that balance, eg in competition with economic or extractive land uses interviews #1 (government), #18 (research), #23 (consultant), #30 (advocacy/NGO) and #39 (advocacy/NGO); and more generally, failing to ensure environmental outcomes are prioritised, interviews #5 (research), #9 (government) and #37 (advocacy/NGO).

[31] Interview #1 (government), an issue also raised, indirectly, in #29 (government); with others suggesting that legislative objectives are not the most important consideration when designing conservation program priorities, eg #12 (consultant) (requirements attached to government funding more significant for direction action) and #14 (government) (national and state biodiversity and protected area strategies more significant).

[32] The ‘purposive approach’ to statutory construction takes the language of the Act as central to interpretation, *Project Blue Sky Inc v Australian Broadcasting Authority* (1998) 194 CLR 355, 381-2 per McHugh, Gummow, Kirby and Hayne JJ; Herzfeld P and T Prince, *Statutory interpretation principles: the laws of Australia* (Lawbook Co, Pyrmont, 2014) [1.75].

[33] Chapter 7 discussion about non-climatic stressors and weaknesses in legal frameworks that have failed to arrest historical and ongoing biodiversity decline.

4.2.2 Objects clauses as an example of legal purposes in conservation law

Objects clauses are the most common form of purpose statement in modern environmental legislation.[34] They are a useful tool for comparing legislative approaches to conservation across jurisdictions as they are explicit, readily identifiable and play a broadly similar role across legal frameworks. This Section analyses objects clauses in Commonwealth, state and territory conservation statutes, and demonstrates the early stages of a promising shift in the focus of conservation objects clauses by state and territory legislatures. In particular, recent legislative reforms have introduced, for the first time, explicit acknowledgement of the challenge of climate change for biodiversity and the value of landscape-scale ecological processes that will be critical to facilitating climate change adaptation.

(a) The content of objects clauses in conservation legislation

The oldest conservation statutes in Australia do not include overarching objects clauses. However, objects directed at particular processes such as protected area management demonstrate an emphasis on preserving biodiversity in current geographic locations and ecological compositions. For example, the *Territory Parks and Wildlife Conservation Act 1977* (NT) objects for wildlife management include ensuring that wildlife survives in 'natural' habitats, and managing 'identified areas of habitat… to ensure the survival of populations of wildlife *within those areas*'.[35] Similarly, the *National Parks and Wildlife Act 1972* (SA) sets management objectives for protected areas, including 'the preservation and management of wildlife… [and] features of geographical, natural or scenic interest'.[36]

Explicit, overarching objects clauses in more recent conservation legislation also typically focus on preserving and protecting the natural environment by reference to historical distributions of species and compositions of ecosystems. For example, both the *Threatened Species Protection Act 1995* (Tas) and *Flora and Fauna Guarantee Act 1988* (Vic) seek to

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[34] Fisher, DE, 'Considerations, principles and objectives in environment management in Australia' (2000) 17(6) *Environmental and Planning Law Journal* 487, 487; APEEL, above n 5, 29.
[35] *Territory Parks and Wildlife Conservation Act 1977* (NT) s 31(1)(a)-(c), emphasis added, and see s 25AB(a)-(c).
[36] *National Parks and Wildlife Act 1972* (SA) s 37(1)(a)-(l); wilderness protection areas and wilderness zones in reserves provided for in the *Wilderness Protection Act 1992* (SA); see also *Nature Conservation Act 2002* (Tas) Sch 1; *National Parks and Reserves Management Act 2002* (Tas) Sch 1.

ensure or guarantee that all native flora and fauna 'can survive, flourish and retain their potential for evolutionary development in the wild'.[37]

Some objects clauses demonstrate a broader approach, such as the *National Parks and Reserves Management Act 2002* (Tas), which sets a proactive object to 'protect against, and rehabilitate following, adverse impacts such as those of fire, introduced species, diseases and soil erosion'.[38] Objects in the Commonwealth EPBC Act recognise the value of conserving ecological communities and ecosystems, including outside the protected area network, and addressing threatening processes.[39] However, these objects still do not anticipate – and so cannot provide guidance for responding to – the scale of biodiversity loss and change that is projected to result from climate change.

Recent legislative reform in the ACT illustrates a new approach to object clause drafting, and appears to signal a shift in the scope of legal purposes for conservation. Structurally, the *Nature Conservation Act 2014* (ACT) is unusual. It specifies a primary object: 'to protect, conserve and enhance the biodiversity of the ACT', and then lists subsidiary objects that describe how the primary object should be achieved.[40] In terms of novel content, the objects relevantly include:

> [P]rotecting, conserving, enhancing, restoring and improving nature conservation, including— [native species and their habitat; ecological communities; genetic, species and community diversity; ecosystems, and ecosystem processes and functions; ecological connectivity; significant landforms including geological and geomorphological features and processes; and landscapes of natural significance.][41]

Until NSW enacted new legislation, the ACT's *Nature Conservation Act 2014* included the only statutory reference in Australia to the conservation significance of ecological connectivity, ecosystem processes and functions and landscapes – each of which have been

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[37] *Threatened Species Protection Act 2002* (Tas) Sch 1, cl 3; *Flora and Fauna Guarantee Act 1988* (Vic) s 4(a); *National Parks Act 1975* (Vic) s 4(ab)(i) and (ii).
[38] *National Parks and Reserves Management Act 2002* (Tas) Sch 1, cl 1, column 2.
[39] EPBC Act s 3(2)(e)(i), (iii), (iv); see also *Flora and Fauna Guarantee Act 1988* (Vic) s 4(a).
[40] *Nature Conservation Act 2014* (ACT) s 6(1), see Section 3.3 below on the structural changes; the *Nature Conservation Act 1992* (Qld) s 4 also sets a single object ('the conservation of nature') with subsidiary objects to be set out in an 'integrated and comprehensive conservation strategy for the whole of the State', s 5(a)-(g); the most recent legislation, the *Biodiversity Conservation Act 2016* (NSW), is the only other statute to set an overarching purpose and multiple sub-purposes.
[41] *Nature Conservation Act 2014* (ACT) s 6(2)(a)(i)-(vii), paraphrased.

identified in adaptation literature as critical for facilitating biodiversity adaptation under climate change.[42]

The most recent conservation legislation enacted in Australia, the *Biodiversity Conservation Act 2016* (NSW), continues that trend.[43] The overarching object of this new legislation is 'to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development'.[44] The Act sets out 15 subsidiary objects including for assessing species extinction risk, regulating human interactions with nature, supporting threat abatement, and taking a collaborative approach to conservation. The following subsidiary objects are of particular interest for this essay:

> (b) to maintain the diversity and quality of ecosystems and enhance their capacity to adapt to change and provide for the needs of future generations, and
> …
> (d) to support biodiversity conservation in the context of a changing climate, and
> (e) to support collating and sharing data, and monitoring and reporting on the status of biodiversity and the effectiveness of conservation actions, and
> …
> (i) to support and guide prioritised and strategic investment in biodiversity conservation.[45]

The objects of the *Biodiversity Conservation Act 2016* (NSW) were explicitly designed with climate change in mind and appear to anticipate more dynamic and adaptive conservation approaches than other statutes described in this section.[46]

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[42] Heller, Nicole E and Erika S Zavaleta, 'Biodiversity management in the face of climate change: A review of 22 years of recommendations' (2009) 142(1) *Biological Conservation* 14; Mawdsley, JR, R O'Malley and DS Ojima, 'A review of climate-change adaptation strategies for wildlife management and biodiversity conservation' (2009) 23(5) *Conserv Biol* 1080.
[43] Though note, the *Biodiversity Conservation Act 2016* (WA) provides only two, overarching objects, which are very general and do not progress the trends identified in this essay.
[44] *Biodiversity Conservation Act 2016* (NSW) cl 1.3; while the legislation provides what may be a welcome connection between the health and wellbeing of the environment and human communities, this overarching object is weak from a biodiversity conservation perspective because any ambition for positive environmental outcomes are framed in terms of their value to humans.
[45] *Biodiversity Conservation Act 2016* (NSW) cl 1.3.
[46] Significant concerns have been raised about this legislation, including 'the expanded use of biodiversity offsets, removal of a legal requirement to "maintain or improve" native vegetation, and the proposed use of

(b) Opportunities to facilitate adaptation through objects clauses

The analysis above indicates a shift in the purposes, and particularly objects, of conservation laws. This shift includes increasing recognition for a broad range of environmental values and, most recently, from preservation to enhancing adaptive capacity and responding to climate change. However, all of the statutory objects analysed above – old and new – provide some opportunities for facilitating biodiversity adaptation under climate change.

First, objects clauses are typically broad in scope, with limited direct enforceability except through obligations to take them into account in decision making.[47] This has provided leeway for environment agencies to implement statutory processes, such as protected area management and threat abatement planning, in more adaptation-oriented ways.[48] In the absence of statutory reform, these objects clauses will continue to support certain climate adaptation strategies. For example, all of the objects clauses described above clearly support the strategy of reducing or removing the effect of invasive species on native biodiversity to improve the resilience of plants, animals and ecosystems to climate changes.[49]

Second, there is a strong sense of ambition in the expression of many objects clauses. The language of the *Flora and Fauna Guarantee Act 1988* (Vic) provides a particularly strong example in its *guarantee* that all native flora and fauna will be able to survive and flourish.[50] This is a bold and aspirational claim that many stakeholders interviewed for this research argued is particularly important under climate change, even though it may be difficult or impossible to achieve.[51] Similarly, the main object of the *Nature Conservation*

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self-assessable codes to "deregulate" clearing native vegetation', Walmsley, Rachel, 'Biodiversity law update: A recipe for regulatory failure?' (2017) 61(3) *Nature New South Wales* 8, 8; this chapter does not express support for the legislation more generally, or its specific, operative provisions.

[47] But see Section 3.3, below.

[48] Eg Parks Victoria, *Ngootyoong Gunditj Ngootyoong Mara South West Management Plan* (Parks Victoria, Melbourne, 2015) and discussion in Chapter 6.

[49] And see Chapter 7.

[50] *Flora and Fauna Guarantee Act 1988* (Vic) s 4(a).

[51] Interviews #6 (advocacy/NGO), #15 (research), #16 (government); #20 (advocacy/NGO), #29 (government); #30 (advocacy/NGO), #39 (advocacy/NGO), describing the guarantee as 'hard-won', and not to be lightly abandoned in favour of something 'achievable'; Environmental Defender's Office NSW ('EDO NSW'), *Climate change and the legal framework for biodiversity protection in Australia: a legal and*

Act 2014 (ACT) is not simply to avoid losing biodiversity in future, but to enhance and improve biodiversity – a statement that may help to drive increasing levels of effort if biodiversity continues to decline.

Third, the emphasis in many statutes on conserving biodiversity 'in the wild' demonstrates an intention to facilitate self-sustaining population processes and avoid creating conservation-dependent biodiversity. This is admirable, as conservation-dependent species and ecological communities are likely to be both increasingly common and increasingly challenging to sustain as the climate changes and conservation budgets become even more stretched.[52]

Finally, the objects of the most recent conservation statutes demonstrate an effort to overcome the limitations of older clauses. For example, objects in the *Nature Conservation Act 2014* (ACT) highlight the environmental value of characteristics such as connectivity, ecosystems, and landscape- and ecosystem-scale functions and processes.[53] These characteristics have traditionally been ignored in conservation laws, but are both valued by human communities, and crucial for improving adaptive capacity in plants, animals and ecological communities and reducing climate vulnerability.[54] The NSW statute also acknowledges the importance of environmental change, including climate change, for conservation.[55] These new objects clauses may be difficult to operationalise and the links between the objects and substantive legal mechanisms in both the ACT and NSW statutes are limited, at best.[56] However, they represent an apparent shift in the attention of legislatures, governments and stakeholders across the community towards more adaptive and dynamic conservation approaches.

scientific analysis discussion paper (2009) 2; *MyEnvironment Inc v VicForests* [2012] VSC 91 (14 March 2012), per Osborn J, aspirational can still be achievable.

[52] Waldron, Anthony et al, 'Targeting global conservation funding to limit immediate biodiversity declines' (2013) 110(29) *PNAS* 12144.

[53] *Nature Conservation Act 2014* (ACT) s 6(2)(x); the only earlier example of significance being ascribed to landscapes and ecosystem processes is in the *National Parks and Wildlife Act 1974* (NSW) s 2A(1)(a).

[54] Eg Dunlop et al, above n 1.

[55] *Biodiversity Conservation Act 2016* (NSW) cl 1.3(b), (d).

[56] Section 3.3, below.

(c) Limitations for facilitating adaptation through objects clauses

While objects clauses in Australian conservation legislation generally express high levels of ambition, their clarity, implementation and climate-readiness leave much to be desired. Despite apparent progress in NSW, there remains an almost universal failure to acknowledge climate change as a challenge to biodiversity conservation. This failure simultaneously complicates 'the tasks of prioritizing conservation efforts and choosing conservation tools'.[57] Setting aside that challenge, this section identifies four weaknesses in the way existing objects clauses are expressed and operationalised. These weaknesses are not explicitly related to climate change but must all be overcome to facilitate adaptation.

First, objects clauses are currently too long, complex and sometimes inconsistent within a single piece of legislation.[58] For example, 31 separate clauses make up the overarching objects of the EPBC Act,[59] with another 18 objects applying only to specific Parts of that Act,[60] and many more applying only to particular divisions, subdivisions or sections.[61] There is no indication of the relative importance of the different objects, either within a single clause or in objects clauses scattered across the EPBC Act.[62] Climate change will sometimes result in irreconcilable differences between objects clauses.[63] For example, as climate change triggers species redistributions, objects clauses seeking to preserve species in their native habitats may come into conflict with clauses that seek to prevent species extinctions, *per se*. Failing to articulate desirable or acceptable conservation outcomes

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[57] Camacho, Alejandro E et al, 'Reassessing conservation goals in a changing climate' (2010) 26(4) *Issues in Science and Technology* 21, 21.
[58] Hawke, Allan, *The Australian Environment Act: report of the independent review of the Environment Protection and Biodiversity Conservation Act 1999* (Report to the Commonwealth Department of the Environment, Water, Heritage and the Arts, 2009) 17, 57.
[59] EPBC Act ss 3, 3A.
[60] Eg EPBC Act Part 13A (7 clauses), Part 14 (11 clauses).
[61] Eg EPBC Act s 390C (division objects), s 303ER (subdivision objects), s 303GN (section objects); *National Parks Act 1975* (Vic) s 4 *cf* s 17(2)(a).
[62] Hawke, above n 58, 17; or between objects such as preserving the character of wilderness areas and promoting the study of ecology and other sciences in the *National Parks Act 1975* (Vic) s 4(a)(i), (iii).
[63] Camacho et al, above n 57, 22; Dunlop et al, above n 1; McDonald, Jan et al, 'Rethinking legal objectives for climate-adaptive conservation' (2016) 21(2) *Ecology and Society* 25, 4-5.

under climate change will make the task of balancing conflicting objects clauses far more complex, less transparent, and potentially more controversial.[64]

Second, objects clauses often incorporate multiple 'kinds' of purpose into a single legislative provision. A single list of objects often includes *overarching goals* such as sustainability or ecologically sustainable development;[65] *outcome-oriented objects* such as 'protecting native species';[66] and procedural or *directing principles*, which describe how a law should be implemented, such as by encouraging community participation, collaboration and conservation education.[67] Failing to clarify the different roles that these purposes play can undermine accountability in decision making and complicate decisions about balancing and prioritising objects in any given scenario. Addressing this weakness will require a more disciplined approach to legislative drafting.[68]

The third weakness for facilitating adaptation through statutory objects clauses is their focus on procedural rather than substantive outcomes. Legislation interposes verbs such as to 'promote', 'further' or 'provide for', before describing a substantive conservation outcome.[69] For example, one EPBC Act object is 'to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance'.[70] This indirect framing creates a procedural purpose, to 'provide for protection', rather than a substantive purpose, to achieve a protected environment. As the climate changes, indirect objects clauses may be insufficient for determining conservation success or failure, and constitute an inappropriately low standard for accountability. A related factor is that objects clauses are operationalised through narrow and weak statutory duties. No conservation legislation in Australia currently imposes a duty to actually achieve its statutory purposes, with duties instead imposing obligations to 'have regard to', 'try', 'endeavour', 'aim', 'promote' or 'pursue' the

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[64] For a practical example of this challenge, see *MyEnvironment Inc v VicForests* [2012] VSC 91 per Osborn JA and, on appeal, *MyEnvironment Inc v VicForests* (2013) 42 VR 456.
[65] Eg EPBC Act s 3.
[66] Eg EPBC Act s 3(2)(e)(i); though process-driven objects are far more common than objects about outcomes.
[67] Eg EPBC Act s 3(1)(f); Hawke, above n 58, 17.
[68] APEEL, above n 5.
[69] Fisher, above n 34, 494.
[70] EPBC Act s 3(1)(a).

purposes.[71] Even comparatively strong duties, such as requiring a decision to be 'consistent with' statutory purposes have been interpreted as requiring no more than that a decision is 'not antipathetic' to the purposes.[72] Stronger duties could enhance the implementation of objects clauses, and help to ensure that reformed legal purposes support more adaptive conservation under climate change.

The fourth weakness for facilitating adaptation is that statutory duties connected to objects clauses are not necessarily applied to every statutory action or to every decision maker. For example, the EPBC Act only imposes a duty in relation to its objects clauses in four decision-making contexts, relevantly including that 'regard must be had to the objects of [the] Act' in making recovery plans, threat abatement plans and wildlife conservation plans.[73] The *National Parks and Wildlife Act 1974* (NSW) takes a broader approach, providing that '[i]n carrying out functions under this Act, the Minister, the Chief Executive and the [National Parks and Wildlife] Service' must give effect to the objects.[74] However, the significance of the objects in the *Biodiversity Conservation Act 2016* (NSW), the newest Australian conservation legislation including the only climate-related object clause, is far more limited. The Minister need only 'consider' the purpose of the Act in developing the state's Biodiversity Conservation Investment Strategy,[75] and 'have regard to the purpose' of the Act in establishing a Biodiversity Assessment Method.[76] The *Biodiversity Conservation Act 2016* (WA) is even more limited, only requiring the objects to be considered in making threatened species recovery plans and in five-yearly reviews of the Act's operation and effectiveness.[77]

The limitations identified here should be addressed in any reform of legal purposes to facilitate climate adaptation. Meeting the challenge that climate change represents for biodiversity – including on private land – will require more than weak, narrow and indirect

[71] Eg *Nature Conservation Act 2014* (ACT) ss 6(3), 95(1)(c); *Biodiversity Conservation Act 2016* (WA) s 80; *Threatened Species Protection Act 2002* (Tas) s 5, Sch 1, cl 1(a); *Flora and Fauna Guarantee Act 1988* (Vic) s 7(1); Fisher, above n 34.
[72] 'It is not necessary to demonstrate that a [decision] promotes or is ancillary to these objectives, nor even that it is compatible with them', *Coffs Harbour Environment Centre Inc v Coffs Harbour City Council* (1991) 74 LGRA 185, 192 per Clarke JA.
[73] EPBC Act ss 270(3)(a), 271(3)(a), 287(3)(a).
[74] *National Parks and Wildlife Act 1974* (NSW) s (3)(a).
[75] *Biodiversity Conservation Act 2016* (NSW) cl 5.3(4)(a).
[76] *Biodiversity Conservation Act 2016* (NSW) cl 6.7(3)(a).
[77] *Biodiversity Conservation Act 2016* (WA) ss 97, 277.

duties that are prevalent in existing laws, and that have often proved difficult or impossible to enforce.

(d) Considerations for developing adaptation-oriented objects: content and structure

Scientific and legal literature addressing conservation purposes are already beginning to respond to some of the broad challenges set out above. A range of government-commissioned and independent reports have identified the need to shift legal purposes away from focussing on *preventing* ecological change, to focussing on *managing* inevitable change.[78] This transition will require legal purposes to be 'forward looking'[79] – while anticipating ongoing change, not a future, stable state.[80] This section identifies key content and structural issues for legal purposes that must be addressed in any legal reform agenda to facilitate biodiversity adaptation.

Facilitating ecological change and adaptation will require a renewed focus on reducing climate vulnerability for species, ecological communities, habitats and ecosystems rather than 'protecting everything' from extinction – so that 'what [species] do becomes more important than where they come from or how many there are'.[81] To the extent that specific species continue to be valued by society, and remain a focus of conservation law and policy, legal purposes will need to shift to emphasising the 'continued existence of species', allowing their 'specific locations and abundances' to be transient.[82] Explicitly recognising that as species and ecosystems respond to climate change, reducing the

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[78] And, in particular, 'managing change to minimise loss', Dunlop, M and PR Brown, *Implications of climate change for Australia's National Reserve System* (A preliminary assessment report to the Commonwealth Department of Climate Change, 2008) 10; Hughes L et al, *National climate change adaptation research plan for terrestrial biodiversity* (National Climate Change Adaptation Research Facility, 2010) 16; and see Williams SE et al, *National climate change adaptation research plan for terrestrial biodiversity: update 2017* (National Climate Change Adaptation Research Facility, 2017).
[79] Stein, BA et al (eds), *Climate-smart conservation: putting adaptation principles into practice* (National Wildlife Federation, 2014); Stein, Bruce A et al, 'Preparing for and managing change: climate adaptation for biodiversity and ecosystems' (2013) 11(9) *Frontiers in Ecology and the Environment* 502, 505-6.
[80] Heller, Nicole E and Richard J Hobbs, 'Adapting conservation goals to global change by expanding them beyond endpoints' (2014) 28 *Conservation Biology* 696.
[81] Interview #38 (research); Davis, Mark A et al, 'Don't judge species on their origins' (2011) 474(7350) *Nature* 153; Glick, Patty, Helen Chmura and Bruce A Stein, *Moving the conservation goalposts: a review of climate change adaptation literature* (US National Wildlife Federation and National Council for Science and the Environment, 2011).
[82] Dunlop et al, above n 1, 95.

likelihood of species becoming extinct will be feasible, but it will be ‘infeasible to prevent all extinctions due to climate change (and other threats)’.[83]

Ecosystem-scale conservation will become more important in adaptation-oriented purposes, including recognising the value of ecological health and ecosystem services and functions, over ‘native’ component species and assemblages.[84] To avoid presumptions of stationarity and preservation, adaptation-oriented purposes targeting ecosystem-scale conservation should be able to focus on biodiversity ‘as it comes and goes and changes’ at a particular location, rather than on whether the ecosystem type that occurs there is well-represented or endangered elsewhere.[85]

Broader again are recommendations to focus conservation at landscape scales, conserving landscapes as combinations of geological, ecological and human components or influences,[86] which function as ‘centres of evolution’.[87] A landscape focus might include measures for conserving a ‘quantity of nature’ in a landscape rather than its quality, providing a mechanism for recognising and conserving ‘human-crafted, degraded, hybrid, novel and restored ecosystems and ecosystems in transition’ as well as ‘native and historically recognisable ecosystems’.[88]

Dunlop and colleagues have synthesised these recommendations into three broad propositions. The propositions suggest that the focus of conservation attention should be on accommodating ‘large amounts of ecological change and the likelihood of significant climate change–induced loss in biodiversity’; with the capacity to ‘remain relevant and feasible under a range of possible future trajectories of ecological change’; while seeking

[83] Ibid.
[84] Eg Hawke, above n 58, 10, 21; Dunlop et al, above n 1, 97.
[85] Dunlop et al, above n 1, 97.
[86] Dunlop et al, above n 1, 99-102.
[87] Lawler, Joshua J et al, ‘The theory behind, and the challenges of, conserving nature's stage in a time of rapid change’ (2015) 29(3) *Conservation Biology* 618; Schramm, Daniel and Akiva Fishman, ‘Legal frameworks for adaptive natural resource management in a changing climate’ (2010) 22 *The Georgetown International Environmental Law Review* 491.
[88] Dunlop et al, above n 1, 99-102; Adams, Vanessa M et al, ‘Planning across freshwater and terrestrial realms: co benefits and trade offs between conservation actions’ (2014) 7(5) *Conservation Letters* 425; Hobbs, Richard J et al, ‘Managing the whole landscape: historical, hybrid, and novel ecosystems’ (2014) 12(10) *Frontiers in Ecology and the Environment* 557; Zedler, Joy B, James M Doherty and Nicholas A Miller, ‘Shifting restoration policy to address landscape change, novel ecosystems, and monitoring’ (2012) 17(4) *Ecology and Society*.

to 'conserve the multiple different dimensions of biodiversity that are experienced and valued by society'.[89] These propositions are not, on their own, intended as new conservation purposes or objects clauses for legislation. However, they are a first attempt to develop clear, specific parameters for adaptation-oriented conservation.

In addition to reforming the *content* of legal and policy purposes to facilitate adaptation, research has also begun to emerge on the task of improving the *structure* of legal purposes to clarify their status and role in legal frameworks for conservation.[90] Recommendations for structural reform are targeted at four key stages. First, an overarching, national conservation goal – such as sustainability or sustainable development – should be embedded as the explicit, primary and overarching goal of all environmental laws.[91] A goal that straddles all environmental laws could improve decision making consistency and increase the significance of biodiversity conservation in other land use and natural resource management decision making. Second, additional explicit objects should be limited to those deemed necessary, for example, to specify discrete, desirable outcomes on the individual subject matter of a statute.[92] Objects clauses should focus on outcomes, not processes;[93] and where there are multiple objects, explicit guidance should be provided on their relative weight.[94] Third, procedural objects should be expressed instead as 'directing principles'.[95] Directing principles are legally enforceable and guide how a statute is implemented, for example, by guiding decision makers as they exercise statutory functions.[96]

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[89] Dunlop et al, above n 1, 3, 17.
[90] See generally, Fisher, above n 34; APEEL, above n 5, 3.
[91] APEEL, above n 5, 15.
[92] Ibid 29 and following.
[93] Ibid 41.
[94] Preston, Hon Justice Brian J, 'Adapting to the impacts of climate change: the limits and opportunities of law in conserving biodiversity' (2013) 30 *Environmental and Planning Law Journal* 375, 378; Hawke, above n 58, 53.
[95] Although, a focus on processes can also be important for facilitating climate adaptation, Craig, Robin Kundis et al, 'Balancing stability and flexibility in adaptive governance: an analysis of tools available in U.S. environmental law' (2017) 22(2) *Ecology and Society* 3; Camacho, Alejandro E and Robert L Glicksman, 'Legal adaptive capacity: how program goals and processes shape federal land adaptation to climate change' (2016) 87(3) *Colorado Law Review* 711.
[96] APEEL, above n 5, 3, 39; the Hawke review's, 'descriptive or explanatory subsidiary objects' would fall under this category, Hawke, above n 58, 58.

The fourth component of these necessary structural reforms is to implement clear, qualitatively or quantitatively measurable conservation objectives.[97] Explicit objectives can promote transparency and accountability; support monitoring and compliance activities; and support decisions between competing conservation purposes and in allocating resources across multiple management actions.[98] Objectives must be able to be regularly reviewed and revised or replaced over time. Statutory provisions are not well-suited to play this role but conservation legislation could require measurable objectives in all statutory instruments. For example, measurable objectives should be obligatory in all protected area management and threat abatement plans, state planning policies, strategies such as *Australia's Biodiversity Conservation Strategy 2010-20130,* and statutory conservation advices and threatened species recovery plans. These obligations could adopt a form similar to the EPBC Act requirement that recovery plans, threat abatement plans and conservation agreements 'state criteria against which achievement of the objectives is to be measured'.[99] One widely-accepted method for setting conservation objectives in this way is to define 'specific, measurable, achievable, realistic and time-bound' ('SMART') objectives.[100] As the climate changes, SMART objectives can also help to identify whether particular conservation interventions are helping or hindering biodiversity adaptation, and whether they represent an efficient, effective and equitable use of limited conservation funds.[101]

4.2.3 Legal and policy purposes are informed by conservation paradigms that may undermine adaptation

In order to address the limitations outlined above, it is important to understanding *why* objects clauses are out of step with environmental reality and conservation best-practice. In Australia, there are three key paradigms that are particularly problematic for facilitating

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[97] Tear et al, above n 28.
[98] Glick, Chmura and Stein, above n 81, 7.
[99] EPBC Act s 271(2)(b) ('threat abatement plans'); the United States *Endangered Species Act 1973* (16 USC § 1531 et seq) s 4(f)(1)(B)(ii) is more specific, requiring 'objective, measurable criteria which, when met, would result in a determination… that [a] species be removed from the' statutory threatened species list.
[100] Eg NSW Environmental Trust, 'What makes a good objective?' (2011) <http://www.environment.nsw.gov.au/resources/grants/11846MEgoodob.pdf>; Western Australian Conservation and Parks Commission, 'Management planning approach' <https://www.conservation.wa.gov.au/management-planning/management-planning-approach.aspx>.
[101] Gunningham, N, P Graborsky, with D Sinclair, *Smart Regulation: designing environmental policy* (Clarendon Press, 1998) 26.

biodiversity adaptation. These paradigms have been identified by analysing how Australia's legal frameworks for conservation are interpreted and implemented, drawing on a growing body of literature about the limitations of environmental law for facilitating climate adaptation.[102] Legal purposes that reflect these paradigms, including by promoting fidelity to historical baseline conditions, may undermine efforts to redirect practical legal tools for conservation towards more adaptive outcomes.

Paradigm 1: nature is stationary and remains essentially unchanging over time

Conservation laws entrench a 'stationarity' paradigm that presumes environmental equilibrium and a natural world that essentially does not change over time.[103] Conservation laws typically emphasise preserving and 'recovering' species populations to historical levels and historical locations – that is, where they are 'native' – without acknowledging that climate change will trigger dramatic and irreversible species redistributions.[104] This paradigm is most evident in older legislation, such as the *National Parks and Wildlife Act 1972* (SA), which includes an object to *preserve* wildlife and other features of interest.[105] However, many of the more modern statutes also presume that existing species assemblages are settled and permanent, as illustrated by statutory definitions of what constitutes 'native' biodiversity.[106]

The concept of 'nativeness' is treated differently across Australian jurisdictions. Nationally, the EPBC Act defines a species as native if, among other factors, it was 'present in Australia or [an] external territory before 1400'.[107] Conversely, species are *not*

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[102] Eg EDO NSW, above n 51; Ruhl, JB, 'Climate change adaptation and the structural transformation of environmental law' (2010) 40 *Environmental Law* 363; Craig, Robin K, '"Stationarity is dead" - long live transformation: five principles for climate change adaptation law' (2010) 34(1) *Harvard Environmental Law Review* 9; Cosens, Barbara et al, 'Identifying legal, ecological and governance obstacles, and opportunities for adapting to climate change' (2014) 6(4) *Sustainability* 2338.
[103] Milly, PCD et al, 'Stationarity is dead: whither water management?' (2008) 319(5863) *Science* 573; Craig, above n 102.
[104] Eg McCormack, Phillipa and Jan McDonald, 'Adaptation strategies for biodiversity conservation: has Australian law got what it takes?' (2014) 31 *Environmental and Planning Law Journal* 114.
[105] *National Parks and Wildlife Act 1972* (SA) s 37(1)(a)-(l).
[106] The IUCN defines a 'native or indigenous species' as a: 'species that is assumed to be intrinsically part of the ecosystem, owing to having developed there, having arrived in the area long before record of such matters was kept, having arrived by natural means (unaided by human action)', IUCN, 'Glossary of Conservation Terms' (nd) <https://www.iucn.org/downloads/en_iucn__glossary_definitions.pdf>.
[107] EPBC Act s 528, the same definition has been adopted in the *Biodiversity Conservation Act 2014* (ACT) s 16 and *Biodiversity Conservation Act 2016* (WA) s 8(2).

native to Queensland if they were 'introduced to another part of Australia by human intervention after the year 1600 and later spread naturally' to Queensland.[108] Species that commenced migrating into NSW from any other state after European settlement are not considered 'animals' for the purposes of the protective provisions of the *Biodiversity Conservation Act 2016*, with implications for species adapting to climate change by shifting their distribution.[109] Further, only native species, 'naturally occurring in Tasmania', may be listed as threatened under the *Threatened Species Protection Act 1995* (Tas) and thus qualify for substantive and prioritised legal protection, including through threat abatement, recovery planning, and prohibitions on taking or disturbing species or their habitat.[110] Uniquely, the *Nature Conservation Act 2014* (ACT) may allow for the possibility of conserving species as they redistribute into the territory from other jurisdictions as the climate changes, as it states that,

> …a native species is eligible to be included in the 'provisional' category on the threatened native species list if: …
> (b) the species—
> (i) occurs *or is likely to occur* in the ACT; and
> (ii) is listed as a threatened native species under a law of another jurisdiction…'.[111]

Defining a species as native – that is, that it 'belongs' in one place and not in another – is often ecologically arbitrary, spatially based on political boundaries, and temporally based on colonial reference points.[112] Nevertheless, the distinction is critical in law, as conservation action is directed at conserving 'native' biodiversity and removing or controlling non-native biodiversity. At the Commonwealth scale and in every Australian state and territory, only native biodiversity qualifies for broad legal protection against 'taking', that is, actions such as killing, harming or moving native animals and plants or destroying or interfering with species' habitat.[113]

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[108] *Nature Conservation Act 1992* (Qld) s 160(7).
[109] *Biodiversity Conservation Act 2016* (NSW) cl 4.3(1), (2).
[110] *Threatened Species Protection Act 1995* (Tas) s 3 (definition), ss 27, 25, 32, 51 respectively.
[111] *Nature Conservation Act 2014* (ACT) s 64(7), emphasis added.
[112] Eg Davis, above n 81, 153.
[113] Eg *Nature Conservation Act 2002* (Tas); *Wildlife (General) Regulations 2010* (Tas); *Nature Conservation Act 2014* (ACT).

The implications of this native/non-native distinction will become more significant for biodiversity as climate change triggers species redistributions. This includes redistributions across state and national boundaries and local extinctions in areas where a species is 'native' despite it persisting in other locations, including novel habitats.[114] Basing the application of conservation laws on whether a species is defined as native and restricting conservation activities to a jurisdiction that will not provide viable habitat for the species in future is unhelpful, and may hinder adaptive conservation strategies. In particular, the legislative distinction may undermine conservation agencies' efforts to manage new ecological interactions as plants and animals arrive in their jurisdiction for the first time as a result of changing temperature and rainfall conditions. If, for example, a bird that has previously only been found in Queensland will only persist in Victoria in future, only conserving that bird under Queensland law is nonsensical. Conservation laws must be sufficiently flexible to provide protection for such species as they shift, including with mechanisms to anticipate and conserve a range of future habitat, or 'climate refugia'.[115]

Legal scholarship around the world increasingly supports a shift from a 'stationarity' or 'preservation' paradigm towards more dynamic conservation approaches.[116] To achieve such a shift, legal frameworks must move away from rigid, temporal reference points for conserving and restoring the environment.[117]

Paradigm 2: conservation laws idealise nature that is 'untouched'

Conservation laws tend to idealise 'wild' nature, uncompromised or untouched by humans, despite climate change undermining the capacity of many species and ecosystems to persist and function without human-planned, climate adaptation interventions. For example, the *Threatened Species Protection Act 1995* (Tas) seeks to ensure that 'all native flora and fauna in Tasmania can survive, flourish and retain their potential for evolutionary

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[114] McCormack, Phillipa C, 'Conservation introductions for biodiversity adaptation under climate change' (2018) (first view) *Transnational Environmental Law* 1.
[115] Ibid, strict definitions of nativeness may similarly complicate proactive, human-mediated introductions of species to areas outside their historical distribution; Bonebrake, Timothy C et al, 'Managing consequences of climate-driven species redistribution requires integration of ecology, conservation and social science' (2017) 93(1) *Biological Reviews* 284.
[116] Craig, above n 102; Camacho, Alejandro E, 'Assisted migration: redefining nature and natural resource law under climate change' (2010) 27(2) *Yale Journal on Regulation* 171.
[117] Ibid; McDonald et al, above n 63; Heller and Hobbs, above n 80.

development *in the wild*',[118] where wild is defined as 'an independent, unpossessed or natural state and not in an intentionally cultivated, domesticated or captive state…'.[119] The presumption that 'wild' nature exists in a form entirely free from human influence, runs counter to research suggesting that natural, wild and pristine landscapes in this sense 'haven't existed for thousands of years'.[120] There is extensive evidence of indirect human effects on the environment in places far from human habitation, including as a result of climate change.[121] Privileging pristine wilderness may therefore no longer be a practical goal for lawmaking, and may impede the development of adaptive conservation actions into the future.

Legal frameworks for conservation primarily emphasise the value of 'the wild' through wilderness legislation[122] and wilderness protected area categories and zoning.[123] For example, wilderness parks in the *National Parks Act 1975* (Vic) are to be managed to 'maximise the extent to which those parks are undisturbed by the influences of the European settlement of Australia'.[124] Efforts to exclude human influences on nature are also apparent in protected area management planning. For example, the Tasmanian Freycinet National Park and Wye River State Reserve Management Plan 2000 prohibits the introduction of fauna or fish that are 'not historically indigenous *within the boundaries of the Park or Reserve*', even if they are native to Tasmania.[125] Such blanket restrictions on intervention may prevent some undesirable environmental changes, such as the introduction of invasive species, but cannot ensure that ecosystems will be unchanged by multi-faceted pressures such as climate change. Restricting human-induced changes may

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[118] *Threatened Species Protection Act 1995* (Tas) Sch 1(3)(a), emphasis added.
[119] *Threatened Species Protection Act 1995* (Tas) s 3.
[120] Boivin, Nicole L et al, 'Ecological consequences of human niche construction: examining long-term anthropogenic shaping of global species distributions' (2016) 113(23) *PNAS* 6388.
[121] Eg Jamieson AJ et al, 'Bioaccumulation of persistent organic pollutants in the deepest ocean fauna' (2017) 1 *Nature Ecology & Evolution* 0051; Scheffers, Brett R et al, 'The broad footprint of climate change from genes to biomes to people' (2016) 354(6313) *Science* 719.
[122] Eg the short title of the *Wilderness Protection Act 1992* (SA) is: 'an Act to provide for the protection of wilderness and the restoration of land to its condition before European colonisation'.
[123] Eg *National Parks Act 1975* (Vic) Part III, Div 1A, Sch 2A ('wilderness parks'); *National Parks Act 1975* (Vic) s 22(4A), (5), Sch 5 ('wilderness zones' in other categories of protected area).
[124] *National Parks Act 1975* (Vic) s 4(ab)(i); see also *Wilderness Protection Act 1992* (SA); although proactive intervention is supported in some circumstances, such as for eradicating invasive species and managing bushfires, eg *National Parks Act 1975* (Vic) s 17A(2)(d) *cf Wilderness Act 1964* (United States) (16 USC § 1131-1136) s 2(c).
[125] Tasmanian Department of Primary Industries, Parks, Water and the Environment, *Freycinet National Park and Wye River State Reserve Management Plan 2000* (2000) 39, emphasis added.

also hinder adaptation strategies such as sourcing climate-adjusted plant species for rehabilitation, and enhancing genetic diversity by introducing 'warm-adapted' native plants and animals from populations outside the protected area.[126]

Australian examples of this paradigm are substantially less prominent than in the United States, where the federal US *Wilderness Act 1964* defines wilderness as: 'an area where the earth and its community of life are untrammeled by man', which retains its 'primeval character' and 'natural conditions', and 'generally appears to have been affected primarily by the forces of nature…' rather than by human presence and intervention.[127] In Australia, laws and policies that prioritise the absence of human influence also typically facilitate human intervention to, for example, eradicate invasive species and manage bush fires.[128] In the case of the *National Parks Act 1975* (Vic), these provisions extend to actively removing 'evidence of developments of non-aboriginal origin'.[129]

Some human impacts, such as mining, and transport and energy infrastructure, should clearly be excluded from high biodiversity-value areas.[130] Conservation legislation seeking to protect 'wild' nature from human influence may have been particularly successful at achieving this outcome.[131] For example, mining is prohibited in wilderness protection areas and zones in South Australia, but not necessarily in other classes of reserve, including national parks.[132] However, with growing numbers of threatened species, heavily fragmented environments, and some ecosystems on the verge or in a state of collapse,[133] many species and systems are already close to the limits of their independent adaptive capacity.[134] In this context, the IPCC has emphasised that human intervention will have an important, if not defining, role in facilitating adjustments in natural systems.[135]

To facilitate climate change adaptation, human intervention should not be excluded as a default position in law or policy. Law reform will be needed to accomplish this shift. Legal purposes and the legal mechanisms that implement them, will need to moderate the entrenched legal dichotomy between biodiversity that is conserved *in situ*, that is,

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[126] As well as restricting the use of conservation introductions for individual species or ecosystem-scale adaptation, including managed relocation and ecological replacements, McCormack, above n 114.
[127] *Wilderness Act 1964* (United States) (16 USC § 1131-1136) s 2(c); and see Camacho and Glicksman, above n 95, 717, 800-806.
[128] Eg *Wilderness Protection Act 1992* (SA) s 12 'Wilderness Code of Management'.
[129] *National Parks Act 1975* (Vic) s 17A(2)(d).

'in nature' or in the 'wild', and *ex situ*, that is, 'out of nature' or 'out of place'.[136] Legal frameworks must also explicitly accept that some species, ecological communities and ecosystems will not be able to be conserved without planned and potentially ongoing human management.[137]

Paradigm 3: biodiversity can be effectively conserved by focusing on 'pieces' and 'pockets' of nature

While some legal purposes are couched in broad terms, such as ensuring that all native flora and fauna can survive and flourish,[138] most conservation laws are implemented far more narrowly. In practice, conservation management is typically directed at nature that demonstrates 'exceptional' characteristics such as rarity or endangerment. For example, statutory lists of threatened species and ecological communities are ranked according to their proximity to extinction – from rare or vulnerable to critically endangered or extinct in the wild – and funding and conservation effort is prioritised accordingly.[139] This hierarchy emphasises rarity, which becomes the basis of value.[140] Emphasising rare species and ecological communities rather than, for example, their ecological roles, levels of interactivity or adaptive potential, can be described as prioritising 'pieces' of nature over ecological processes, connections and functions. This is not to suggest that individual species populations close to extinction should not be the subject of conservation effort.

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[130] Eg Laurance, WF et al, 'Averting biodiversity collapse in tropical forest protected areas' (2012) 489(7415) *Nature* 290.
[131] Taylor, Martin FJ, James A Fitzsimons and Paul S Sattler, *Building nature's safety net 2014: a decade of protected area achievements in Australia* (WWF-Australia, 2014) 101, 104, 109.
[132] *Wilderness Protection Act 1992* (SA) s 25, *cf National Parks and Wildlife Act 1972* (SA) s 43(2), (5).
[133] Cresswell ID and HT Murphy, *Australia State of the Environment 2016: Biodiversity* (Independent report to the Minister for the Environment and Energy, Commonwealth Government, 2017) <https://soe.environment.gov.au/theme/biodiversity>; Mac Nally, R et al, 'Collapse of an avifauna: climate change appears to exacerbate habitat loss and degradation' (2009) 15(4) *Diversity and Distributions* 720.
[134] Eg Jezkova T and JJ Wiens, 'Rates of change in climatic niches in plant and animal populations are much slower than projected climate change' (2016) 283(1843) *Proceedings of the Royal Society B: Biological Sciences* 1.
[135] Lorenzoni I, WN Adger and KL O'Brien, *Adapting to climate change: thresholds, values, governance* (Cambridge University Press, 2009).
[136] Braverman, Irus, 'Conservation without nature: the trouble with in situ versus ex situ conservation' (2014) 51 *Geoforum* 47, 47.
[137] Ibid.
[138] *Threatened Species Protection Act 2002* (Tas) Sch 1, cl 3; *Flora and Fauna Guarantee Act 1988* (Vic) s 4(1).
[139] Eg EPBC Act s 179 and *Threatened Species Protection Act 2002* (Tas) s 13.
[140] Interview #38 (research); eg of the long list of threatened species in Australia, just 20 mammals, birds and plants have been prioritised in the Commonwealth Government's 'Action Plan 2015-6', above n 11.

Rather, greater conservation effort must be directed at conserving ecosystems and ecological interactions because they will also be dramatically affected by climate change, with significant flow on effects for non-human species and their habitats, as well as human communities and wellbeing.[141]

The National Reserve System ('NRS') demonstrates a somewhat more holistic approach, as it is targeted at developing a comprehensive, adequate and representative ('CAR') network of protected areas. However, these criteria are typically operationalised by reference to the 'original' extent and assemblages of a given bioregion. In practice, the ecosystems and ecological communities that are economically valuable – including for forestry, farming and mining – continue to be underrepresented in the NRS.[142] Further, while the NRS will continue to be fundamental for conservation as the climate changes,[143] it cannot address the impact of intensive human activity on biodiversity located outside of the NRS, even activities that take place on the boundaries of established protected areas. Despite the best intentions, the legal framework that establishes the NRS still prioritises 'pockets' of nature, over broader, whole-of-landscape conservation.

A legal emphasis on conserving 'the rest' – that is, biodiversity located outside the NRS and species and ecological communities that are not currently threatened – is more important under climate change than it has ever been. This is because many important areas for biodiversity occur on private land that may never be included in the NRS.[144] 'The rest' is also critically important because climate change will trigger some species redistributions from within the NRS to land outside its boundaries. Legal frameworks must be reformed to overcome this paradigm of prioritising 'pieces and pockets'.

The challenges of this paradigm for conservation have long been recognised. This is demonstrated in the level of support for strategies that enhance connectivity across

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[141] Pecl, Gretta T et al, 'Biodiversity redistribution under climate change: impacts on ecosystems and human well-being' (2017) 355(6332) *Science* eaai9214-1; Hawke, above n 58, 105-6, recommending 'ecosystems of national significance' be introduced as a new matter of national environmental significance, identified not by species assemblage or location but by ecological character, in the manner of Ramsar wetlands.

[142] Taylor, above n 131.

[143] Dunlop, Michael et al, *The implications of climate change for biodiversity conservation and the National Reserve System* (Final synthesis report prepared for the Australian Government, CSIRO Climate Adaptation Flagship, 2012).

[144] Eg Vine, Samantha et al, *KBAs in danger: the state of Australia's Key Biodiversity Areas in 2017* (Birdlife Australia, 2017).

landscapes, including in agricultural regions.[145] A more holistic approach in legal frameworks for conservation could allow multiple diverse values to be prioritised, including values associated with abundant, highly interactive, or non-native plants and animals and novel ecosystems, as well as ‘pristine’, representative and critically endangered biodiversity. As climate impacts have cascading effects across human and non-human communities and systems, a conservation focus on ‘pieces and pockets’ will be increasingly inappropriate for triggering conservation intervention.

4.3 Legal design principles for adaptation-oriented biodiversity conservation

This thesis seeks to contribute to the design and development of adaptation-oriented legal frameworks for biodiversity conservation. Section 4.3 provides the foundation for that task by identifying three ‘design principles’ for new or reformed conservation laws. Legal design principles can guide legislators as they draft or amend conservation legislation, specifying how laws can facilitate climate adaptation more effectively.[146] A range of general legal design principles for environmental law have been identified and developed over recent years.[147] These include Martin and Gunningham’s ‘core principles for natural resource management law reform’,[148] and the design principles that the Australian Panel of Experts on Environmental Law (‘APEEL’) has proposed to underpin the next generation of Australia’s environmental laws.[149]

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[145] Chapter 3, Section 3.3.2.
[146] APEEL, above n 5, 3; but do not extend to institutional design principles such as those pioneered by Ostrom to govern common pool resources, eg Ostrom, Elinor *Governing the commons: the evolution of institutions for collective action* (Cambridge University Press, 1990); Ostrom, Elinor ‘Beyond markets and states: polycentric governance of complex economic systems’ (2010) 100(3) *American Economic Review* 641.
[147] Including in international instruments such as *World Charter for Nature*, GA Res 37/7, UN GAOR, 37th sess, 48th plen mtg, Supp No 51, UN Doc A/RES/37/51 (28 October 1982); Earth Charter Commission, *Earth Charter* (29 June 2000) <http://earthcharter.org>.
[148] Martin, Paul and Neil Gunningham, ‘Leading reform of natural resource management law: core principles’ (2011) 28(3) *Environmental and Planning Law Journal* 137, developing on their highly influential ‘Smart regulation’, Gunningham, N, P Graborsky, with D Sinclair, *Smart Regulation: designing environmental policy* (Clarendon Press, 1998).
[149] APEEL, above n 5, 5, Table: ‘Summary of the foundations of environmental law’ including principles such as smart regulation; economic measures; widely-recognised regulatory tools and mechanisms; and environmental democracy.

An important qualification is needed here. Law reform can be perceived as bringing abrupt change, which may not be considered necessary, appropriate or desirable by everyone that is affected. One participant described their observation of recent conservation law reform as a process of 'forc[ing] people to do stuff, as opposed to changing cultures that have been built up [sometimes] over hundreds of years'.[150] In interviews for this research, several participants emphasised the need to approach climate adaptation-oriented law reform differently. In particular, they identified the need for substantial cultural and institutional change, not just law and policy reform, to ensure that reforms are legitimate and are understood by those affected. These participants identified the need to engage honestly and proactively, developing and maintaining trust between diverse groups including policy makers, landholders and conservation advocates.[151] It became clear, over the course of this research, that governance challenges for the kinds of reform proposed in this thesis are both 'wicked' and normative.[152] This thesis acknowledges these challenges, and the rapidly expanding scholarship seeking to respond to them,[153] but takes as self-evident that broad and deep engagement will be necessary as part of any law and policy reform process.

The design principles discussed in this section have been selected on the basis that they are missing from, or poorly represented in, conservation laws in Australia. The first principle proposes a greater emphasis on proactive approaches to conservation – both in terms of human intervention for conservation management and to set a conservation standard for adaptation that is higher than simply 'doing no harm'. The second principle focuses on the

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[150] Interview #22 (government).
[151] Eg interviews #12 (consultant), #22 (government), #23 (consultant), #24 (government) and #29 (government).
[152] For recent syntheses of climate adaptation governance scholarship, demonstrating the importance of social learning in adaptation responses, see Chaffin, Brian C, Hannah Gosnell and Barbara A Cosens, 'A decade of adaptive governance scholarship: synthesis and future directions' (2014) 19(3) *Ecology and Society* 56; Huitema, D et al 'The governance of adaptation: choices, reasons and effects. Introduction to the Special Feature' (2016) 21(3) *Ecology and Society* 37.
[153] For recent scholarship on adaptive, participatory and anticipatory governance, to provide institutional capacity for developing, implementing and adjusting adaptive governance instruments, see Boyd, Emily, 'Anticipatory governance for social-ecological resilience' (2015) 44(Supp1) *AMBIO* S149; Ison, Raymond L, Kevin B Collins and Phillip J Wallis, 'Institutionalising social learning: towards systemic and adaptive governance' (2015) 53(Part B) *Environmental Science & Policy* 105; Pahl-Wostl, Claudia, 'A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes' (2009) 19(3) *Global Environmental Change* 354; Cosens, Barbara A, 'Legitimacy, adaptation, and resilience in ecosystem management' (2013) 18(1) *Ecology and Society* 3; Wyborn, Carina A, 'Connecting knowledge with action through coproductive capacities: adaptive governance and connectivity conservation' (2015) 20(1) *Ecology and Society* 11; Camacho, Alejandro E, 'Adapting governance to climate change: managing uncertainty through a learning infrastructure' (2009) 59 *Emory Law Journal* 1.

need to enhance flexibility in law and policy without compromising legal accountability. The third principle reflects a broad and growing literature on adaptive management for climate adaptation, accepting that adaptive management ought to be a fundamental component of legal frameworks for conservation under climate change.

These design principles reflect recurring themes in legal, ecological and governance scholarship for biodiversity adaptation. The design principles are used in the remainder of this thesis in two distinct ways. First, the principles are used as 'performance indicators', to identify and assess those components of laws and policies that may facilitate climate adaptation in the short-to-medium term. Second, the design principles are used to guide recommendations for future reform, to improve the adaptive capacity of legal frameworks over the long term.

Principle 1: Adopt more proactive approaches to conservation

Adaptation-oriented laws must maximise opportunities for independent adaptation by removing barriers to dispersal and reducing non-climatic stressors such as habitat clearing and invasive species.[154] However, the rate and magnitude of climate-driven environmental change will exceed the capacity of most species and communities to survive without some form of human intervention.[155] Conservation decision makers must be equipped to 'confront and respond, quickly and effectively, to new challenges and issues as they arise'.[156] Improving legal responsiveness will require a shift from reactive and *ad hoc* to proactive and holistic approaches to conservation.[157] This principle comprises two limbs. The first limb advocates greater legal and policy support for proactive conservation intervention, especially for endemic biodiversity at the limits of its climatic tolerance or with highly specialised environmental requirements that cannot easily be replicated in another location.[158] The second limb proposes explicit legal and policy support for actions

154 Bonebrake, above n 115, 31.
155 Eg Jezkova and Wiens, above n 134.
156 Hobbs RJ et al, 'Intervention ecology: applying ecological science in the twenty-first century' (2011) 61(6) *BioScience* 442; Trouwborst, Arie, 'International nature conservation law and the adaptation of biodiversity to climate change' (2009) 21 *Journal of Environmental Law* 419, 424.
157 Trouwborst, above n 156, 424; Schramm and Fishman, above n 87, 501; Stein et al, above n 79, 505-6.
158 Steffen et al, above n 1, 7 listing the characteristics of 'species most at risk'.

that generate environmental gains, over and above obligations to avoid environmental harm.

(a) Proactive human intervention in biodiversity management for adaptation

Current conservation laws are often reactive in orientation. For example, a species cannot be listed as threatened without evidence of historical or current decline or an imminent threat of extinction.[159] Law and policy for expanding the National Reserve System, and recovery planning for listed threatened species and ecological communities, demonstrate a more proactive approach, at least in theory. However, even these mechanisms can be reactive in practice. For example, statutory recovery planning is only initiated for listed threatened species and ecological communities, and even then, only for those closest to extinction or in response to litigation demanding that such plans be prepared.[160] Even when recovery plans have been prepared, agency responses to changes in threat levels can be slow and bureaucratic.[161] For example, despite clear evidence of rapid population declines, a decision to establish a captive breeding population for the endangered Christmas Island Pipestrelle (*Pipistrellus murrayi*) was made too late to avoid the species' extinction.[162]

In addition, a core purpose of most legal frameworks for conservation in Australia is to conserve biodiversity in 'natural' or 'wild' environments, removed from human influences.[163] Provisions for conserving species 'in the wild' are typically not limited to particular locations or land tenures, so they do not necessarily represent a barrier to adaptation strategies such as managed relocation. However, they may create confusion for the conservation status of species and ecological communities that *only* persist in:

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[159] Eg EPBC Act s 179(4)(b), '[a] native species is eligible to be included in the endangered category at a particular time if, at that time: …it is facing a *very high risk of extinction* in the wild in the near future, as determined in accordance with the prescribed criteria', emphasis added.
[160] Eg Victorian Auditor General's Office, *Administration of the Flora and Fauna Guarantee Act 1988* (2009) 1.
[161] Martin, Tara G et al, 'Acting fast helps avoid extinction' (2012) 5(4) *Conservation Letters* 274; Woinarski, John CZ et al, 'The contribution of policy, law, management, research, and advocacy failings to the recent extinctions of 3 Australian vertebrate species' (2016) 31(1) *Conservation Biology* 13.
[162] Woinarski et al, above n 161.
[163] As discussed in Section 4.2.3; eg *Threatened Species Protection Act 1995* (Tas) Sch 1, Part 2, cl.3(a).

- semi-wild environments including free-ranging enclosures or open plain-style zoos designed to maintain wild behaviours, such as partially-captive populations of Tasmanian Devils (*Sarcophilus harrisii*);[164] or

- novel or constructed environments,[165] such as the constructed, above-ground tanks used to raise critically endangered Southern Corroborree Frogs (*Pseudophryne corroboree*), preventing juveniles from being infected with the fatal amphibian chytrid fungus (*Batrachochytrium dendrobatidis*).[166]

As the climate changes, the level of human intervention in a species' habitat may be inappropriate as a measure for defining its survival or categorisation as 'extinct in the wild' or 'non-conserved'.[167]

Consistent with the emphasis of this thesis on *planned* biodiversity adaptation, this design principle advocates a greater focus on proactive intervention in legal frameworks for conservation, alongside, and in some cases instead of, reactive approaches that prioritise native and natural environments removed from human intervention.[168] This 'proactivity principle' would ensure legal engagement with, and oversight for, high-intensity interventions such as conservation introductions. Focusing on proactivity could also help to reframe the focus of more traditional conservation strategies, such as protected areas, on anticipating or at least responding more rapidly to inevitable and ongoing environmental change.

This first limb of the 'proactivity principle' would not displace the aim of minimising the proportion of species, communities and ecosystems that rely on conservation management

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[164] Tasmanian Department of Primary Industries, Parks, Water and Environment, *Draft recovery plan for the Tasmanian devil (Sarcophilus harrisii)* (2010) 18.
[165] Rohlf, DJ, C Carroll and B Hartl, 'Conservation-reliant species: toward a biology-based definition' (2014) 64(7) *BioScience* 601; Braverman, Irus, 'Captive for life: conserving extinct in the wild species through ex situ breeding' in Lori Gruen (ed), *The ethics of captivity* (Oxford University Press, 2014) 193.
[166] The tanks are located within the frogs' native ranges and adult frogs are later reintroduced into native alpine bog habitats; see Corroboree Frog Recovery Program, 'Reintroductions into the wild' <http://www.corroboreefrog.org.au/conservation/reintroductions-into-the-wild/>.
[167] Eg *Threatened Species Protection Act 1995* (Tas) s 3 defines 'survival' of a species as 'the continued existence of viable populations of a taxon in the wild', with the implication that if it is not in a wild state, it does not survive for the purposes of that Act; Braverman, above n 136, 52, 54.
[168] Eg Camacho, Alejandro E, 'Transforming the means and ends of natural resources management' (2011) 89 *North Carolina Law Review* 1405; Camacho, Alejandro E, 'Going the way of the dodo: de-extinction, dualisms and reframing conservation' (2015) 92(4) *Washington University Law Review* 849.

for survival.[169] Rather, it would ensure that that aim is not applied too narrowly, through reliance on the concept of a 'natural', non-human 'wild'. Similarly, this design principle would not necessarily replace less proactive conservation approaches. 'Making space' for biodiversity to adapt and persist without active management may continue to be the most effective adaptation action in some cases.[170] For example, establishing a protected area that excludes new threats from industrial-scale activities such as forestry or mining may be the difference between adaptation and extinction for some populations, ecological communities and ecosystems. Conservation managers will also continue to apply 'reactive' species-specific recovery laws to secure threatened species populations, at least in the short-term. However, even these activities may be made more proactive by shifting their focus to include locations for habitat conservation outside those species' historical distributions.[171]

(b) Proactive legal and policy support for generating environmental 'gains'

The scale of biodiversity loss experienced across the Australian continent since European colonisation is vast.[172] Protecting the environment from further harm will be insufficient to safeguard ecosystem functions and enhance the adaptive capacity of biodiversity as the climate changes.[173] Active intervention to generate environmental gains might include ecological restoration, rewilding, creating functional connectivity and improving soil diversity and erosion control. Such interventions can facilitate adaptation and mitigate the effects of climate change at local scales. For example riparian revegetation projects can improve the health of freshwater species and river systems and moderate future increases in water temperatures.[174] Several stakeholders interviewed for this research suggested that if preservation is unachievable as the climate changes, conservation law should be seeking

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[169] Eg Scott, Michael J et al, 'Conservation-reliant species and the future of conservation' (2010) 3(2) *Conservation Letters* 91.
[170] Doremus, Holly, 'Adapting to climate change through law that bends without breaking' (2010) 2 *San Diego Journal of Climate and Energy Law* 45.
[171] Heller and Zavaleta, above n 42, 18.
[172] Cresswell ID and HT Murphy, *Australia State of the Environment 2016: Biodiversity* (Independent report to the Minister for the Environment and Energy, Commonwealth Government, 2017) <https://soe.environment.gov.au/theme/biodiversity> ('SotE 2016'); Steffen et al, above n 1.
[173] SotE 2016, above n 172; Richardson, Benjamin J and Ted Lefroy, 'Restoration dialogues: improving the governance of ecological restoration' (2016) 24(5) *Restoration Ecology* 668.
[174] Heller and Zavaleta, above n 42, 25 and references cited therein.

to facilitate *improvement* in environmental conditions and ecological health, even as they change:

> We have lost a lot over decades and centuries, and the job is really to claw some of that back, and create sort of *positive growth* from an environmental perspective as opposed to stagnant maintenance of values.[175]

Laws and policies that focus on generating environmental gains are rare in Australia, arising only in legal provisions for 'environmental restoration' or 'rehabilitation'.[176] Obligations may be imposed either as a penalty for causing harm to biodiversity[177] or as a form of 'make good' obligation, including to rehabilitate after mining operations and to clean up pollution following a spill.[178] Some statutes recognise the concept of 'environmental improvement' in overarching objects clauses. For example, the main object of the *Nature Conservation Act 2014* (ACT) is to 'protect, conserve and *enhance* the biodiversity of the ACT'.[179] The Commonwealth *Water Act 2007* includes as an object, to 'protect, *restore* and provide for the *ecological values and ecosystem services* of the Murray-Darling Basin',[180] emphasising ecological health rather than reinstating specific, historical assemblages in particular locations.

Natural resource management legislation also provides for environmental rehabilitation, other than as a legal penalty, in some cases. For example, the *Natural Resources*

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[175] Interview #11 (advocate).

[176] Richardson, Benjamin J, 'The emerging age of ecological restoration law' (2016) 25(3) *Review of European, Comparative & International Environmental Law* 277; 173 Richardson and Lefroy, above n 173; Richardson, Benjamin J, 'Reclaiming nature: eco-restoration of liminal spaces' (2015) 2(1) *Australian Journal of Environmental Law* 1.

[177] Eg *Biodiversity Conservation Act 2016* (WA) s 243; *Biodiversity Conservation Act 2016* (NSW) Part 11 Division 4 'remediation orders'; *Flora and Fauna Guarantee Act 1988* (Vic) s 61; rare examples also exist in protected area legislation, eg *National Parks Act 1975* (Vic) s 21D(6); the EPBC Act does not impose rehabilitation or restoration obligations.

[178] E.g. *Environmental Management and Pollution Control Act 1994* (Tas) s 74F (the Director may issue a 'remediation notice'); and the *Environment Protection Act 1970* (Vic) s 62A ('Notice to take clean up and on-going management measures'), s 67AC allows a court to order an offender to take 'specified actions' following contamination of the environment or the release of a pollutant which, interestingly, may include 'to carry out a specified project for the restoration or enhancement of the environment in a public place or for the public benefit (*even if the project is unrelated to the offence*), s 67AC(2)(c), emphasis added.

[179] *Nature Conservation Act 2014* (ACT) s 6(2); see also *Catchment and Land Protection Act 1994* (Vic) s 4(ii); protected area legislation may also specify management objectives for restoring the environment, eg *National Parks and Reserves Management Act 2002* (Tas) Sch 1, cl 1-10 including restore protected areas from the effects of, eg, a bushfire or damage caused by invasive species.

[180] *Water Act 2007* (Cth) s 3(d)(ii), emphasis added.

Management Act 2004 (SA) provides that the Minister may enter into management agreements that relate to, among other things, 'the conservation… *enhancement*, restoration or rehabilitation of any natural resources'.[181] Legal purposes and practical legal mechanisms to generate environmental gains, other than liability for environmental harm, are otherwise absent from Australian conservation laws.[182]

'Ecological restoration' is an explicit target under the Convention on Biological Diversity,[183] where it has historically been interpreted through the lens of stationarity – as a task of restoring something to a former place, state or condition.[184] For example, the IUCN glossary defines ecosystem rehabilitation as the '[r]e-establishment of part of the productivity, structure, function and processes of the original ecosystem'.[185] However, the interpretation of ecological restoration, including under the CBD, has been reframed over recent years to acknowledge the need for climate adaptation.[186] Restoration practice, at least in some cases, has also begun to shift away from adherence to re-creating past ecological states,[187] incorporating climate and other projections of future environmental change into decision making, for example about the origin of seed stock for re-plantings,[188]

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[181] *Natural Resources Management Act 2004* (SA) s 205; see also *Conservation and Land Management Act 1984* (WA) s 33(1)(cc).
[182] *Cf* the Canadian *National Parks Act* (SC 2000, c32) s 8(2) provides that 'the maintenance or restoration of *ecological integrity*…shall be the first priority of the Minister administering the Act', referenced in APEEL, above n 5, 40.
[183] Targets 14, 15 of the Aichi Biodiversity Targets, above n 12; and see Conference of the Parties to the Convention on Biological Diversity, *Decision of the COP in its Twelfth Meeting, Held in Pyeongchang from 6 - 17 October 2014 – Ecosystem conservation and restoration*, Un Doc UNEP/CBD/COP/DEC/XII/19 (17 October 2014); and *Decision of the COP in its Eleventh Meeting, Held in Hyderabad from 8 - 19 October 2012 – Ecosystem restoration*, Un Doc UNEP/CBD/COP/DEC/XI/16 (5 December 2012) ('Decision XI/16').
[184] Eg Akhtar-Khavari, Afshin and Anastasia Telesetsky 'From protection to restoration: a challenge for environmental governance' in Fisher D (ed) *Research handbook on fundamental concepts of environmental law* (Elgar online, 2016) 50-81, 51.
[185] Mach, KJ, S Planton and C von Stechow (eds), 'Annex II: Glossary' in IPCC, *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the IPCC* (Cambridge University Press, 2014).
[186] Including acknowledging that 'fully restoring an ecosystem to its original state is increasingly challenging and may not always be achievable', Decision XI/16, above n 183, *Preamble* <https://www.cbd.int/decision/cop/default.shtml?id=13177>; Richardson and Lefroy, above n 173; Zedler, Doherty and Miller, above n 88.
[187] Eg Druschke, C, M Laura and K Hychka, 'From restoration to adaptation: the changing discourse of invasive species management in coastal New England under global environmental change' (2016) 18(9) *Biological Invasions* 2739.
[188] Eg Prober, SM, 'Climate adaptation and ecological restoration in eucalypts' (2016) 128 *The Royal Society of Victoria* 40; Perring, Michael P, Patrick Audet and David Lamb, 'Novel ecosystems in ecological restoration and rehabilitation: innovative planning or lowering the bar?' (2014) 3(1) *Ecological Processes* 8.

and by adding habitat features for adaptation, such as large woody debris or fabricated tree hollows for habitat.[189]

Without clear legal and policy guidance for proactive, landscape-scale renewal, conservation management directed at generating positive environmental effects or environmental 'gains' will be the result of ad hoc or incremental decision making.[190] Expressing this design principle in legal frameworks for conservation will require acknowledgement that addressing past environmental losses now demands active support for generating future 'environmental gains'.[191]

Principle 2: Promote 'accountable flexibility'

Uncertainty is a defining characteristic of conservation decisions under climate change, and the need for greater flexibility in environmental decision making to respond to that uncertainty[192] is a common recommendation in both legal and non-legal scholarship.[193]

Greater flexibility may be achieved through explicit adoption of conservation triage approaches, and through the operation of adaptive management, described in design principle 3, below.[194] However, the flexibility to accept some inevitable environmental loss under climate change must be balanced by enhanced legal accountability, to prevent a 'morose complacency about losses that may be preventable'.[195]

There is relatively little guidance available for law and policy makers for ensuring that enhanced flexibility does not result in arbitrary decision making or compromise ambitious conservation goals.[196] This design principle, promoting accountable flexibility, responds to

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189 Gilfedder L, 'The Running Postman' (Tasmanian Government, 2017) 8 <http://dpipwe.tas.gov.au/Documents/Running%20Postman%20June%202017%20WEB.pdf>.
190 APEEL, above n 5, 37; Richardson, above n 176.
191 Zedler, Doherty and Miller, above n 88.
192 Without resorting to flexibility through 'non-enforcement' of rigid legal rules, Arnold, CA and L Gunderson, 'Adaptive law and resilience' (2013) 43 *Environmental Law Reporter* 10426, 10436.
193 Ruhl, above n 102, 413-427; Preston, above n 94; Dovers, Stephen R and Adnan A Hezri, 'Institutions and policy processes: the means to the ends of adaptation' (2010) 1(2) *Wiley Interdisciplinary Reviews: Climate Change* 212, 227; APEEL, above n 5, 36-7; note the potential for greater flexibility and administrative discretion to challenge legal certainty and finality, eg Craig, above n 95.
194 Craig, above n 102, 65.
195 Craig, above n 102, 63-69.
196 Eg Preston, above n 94, 386-7; with the notable exception of Professor Robin Craig, who proposed a 'principled' form of flexibility to balance these competing imperatives in her seminal paper, 'Stationarity is

that challenge by advocating three 'balancing' mechanisms to inform law and policy reform. First, conservation triage and prioritisation processes that provide flexibility in the application of rigid standards such as 'preventing all extinctions' should be the subject of explicit, statutory decision-making criteria. Second, enforceable decision-making standards should direct *how* decisions are made but not *what* any given decision ought to be. These standards can provide flexibility for choosing between multiple options while ensuring accountability through rigorous decision-making processes. Third, regressive conservation law reforms should be prohibited, provided the definition of regression can be clearly distinguished from long-term, adaptive conservation approaches and strategies. Each of these mechanisms can help to ensure that inevitable, climate-driven biodiversity loss is not used as a reason to 'give up' on conservation.[197]

(a) Ensure triage decisions are guided by transparent decision-making criteria

Despite many statutory objects clauses suggesting that all biodiversity should be conserved, and some advocates proposing a 'zero extinction' approach to conservation,[198] current conservation funding simply cannot ensure the preservation of every component of biodiversity.[199] There is growing recognition that, without a substantial injection of new funding, some form of environmental triage is inevitable.[200] The concept of triage is adopted from battlefield medicine and describes a 'crisis' approach to decision making. For biodiversity conservation, triage is defined as 'the process of prioritising the allocation

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dead', above n 102, which was developed further in Craig Robin K, 'The Clean Water Act, climate change, and energy production: a call for principled flexibility regarding "existing uses"' (2013) 4(2) *George Washington Journal of Energy & Environmental Law* 26, 27, 44; and adopted in Potter, HL, 'Regulating for resilience: principled flexibility and environmental co-management in the Mackenzie Valley' (Masters' thesis *Electronic Thesis and Dissertation Repository*, 2016) 4267.

[197] Craig, above n 102, 69; Ruhl, above n 102, 410-12; as well as addressing the challenge to traditional legal emphases on certainty and finality in decision making, see Craig, Robin K et al, 'Balancing stability and flexibility in adaptive governance: an analysis of tools available in U.S. environmental law' (2017) 22(2) *Ecology and Society* 3.

[198] Parr, MJ et al, 'Why we should aim for zero extinction' (2009) 24(4) *Trends Ecol Evol* 181; Locke, H, 'Nature needs half: a necessary and hopeful new agenda for protected areas in North America and around the world' (2014) 31 *The George Wright Forum* 359; Dinerstein, Eric et al, 'An ecoregion-based approach to protecting half the terrestrial realm' (2017) 67(6) *BioScience* 534.

[199] Bottrill, Madeleine C et al, 'Finite conservation funds mean triage is unavoidable' (2009) 24(4) *Trends in Ecology & Evolution* 183; Bottrill MC et al, 'Is conservation triage just smart decision making?' (2008) 23(12) *Science and society* 649.

[200] Bottrill et al 2008, above n 199; Jachowski, David S and Dylan C Kesler, 'Allowing extinction: should we let species go?' (2009) 24(4) *Trends in Ecology & Evolution* 180.

of limited resources to maximise conservation returns, relative to the conservation goals, under a constrained budget'.[201]

Bottrill and colleagues argue that conservation triage is 'no more than the efficient allocation of conservation resources', to maximise the effect of scarce resources, and that 'we risk wasting scarce resources if we do not follow its basic principles'.[202] However, the implication that triage is simply 'common sense' conceals ongoing challenges in its application. There is ongoing resistance to the concept, including in conservation circles and in some government agencies, with one stakeholder interviewed for this research describing triage as simply a 'lack of motivation'.[203] Additional challenges include the potential to 'brush over' uncertainty and complexity in biodiversity management, and of finding an acceptable balance between competing financial, biological, ecological, social and political conservation priorities.[204]

In practice, conservation management agencies are already prioritising funding, planning and active interventions across Australia. For example, resource-intensive threatened species recovery plans have not been prepared for every one of the thousands of listed threatened species in Australia.[205] Even when a recovery plan exists, not every plan is funded or implemented, and decisions about which species and plans will be funded are rarely explicit. Maximising conservation outcomes from the limited resources available is a critical and valuable goal. Achieving resource efficiency in conservation while also avoiding 'giving up' or lacking motivation, is the central challenge that the 'accountable flexibility' design principle seeks to meet. This principle requires that conservation

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[201] Bottrill et al 2008, above n 199, 649.
[202] Ibid.
[203] Interview #18 (research); similar sentiments expressed in interviews #15 (research), #39 (advocate); Kilham, E and S Reinecke, *"Biggest bang for your buck": Conservation triage and priority-setting for species management in Australia and New Zealand* (INVALUABLE Policy Brief 0115, 2015) 7-9; Hagerman, Shannon M and Terre Satterfield, 'Agreed but not preferred: expert views on taboo options for biodiversity conservation, given climate change' (2014) 24(3) *Ecological Applications* 548 suggest that this is changing, at least in the United States, finding 'widespread agreement with a set of previously contentious approaches and actions, including the need for frameworks for prioritization and decision-making that take expected losses…into consideration', at 548, 556.
[204] Small, E, 'The new Noah's Ark: beautiful and useful species only' (2011) 12(4) *Biodiversity* 232; Soderquist, T, 'What we don't know and haven't learnt about cost-benefit prioritisation of rock-wallaby management' (2011) 33(2) *Australian Mammalogy* 202.
[205] NSW Department of Environment and Climate Change, *Introducing the NSW Threatened Species Priorities Action Statement (PAS)* (2007) ('NSW priorities action statement') <http://www.environment.nsw.gov.au/resources/threatenedspecies/threatspecpas07168.pdf>.

agencies are guided by clear, preferably statutory, decision-making criteria as they adopt and implement triage climate change.[206] The implications of conservation triage can be serious, including potential for 'low priority' species to become extinct. Explicit decision-making criteria would improve transparency, community awareness, accountability and, ideally, could increase support for greater conservation investment.[207]

A formal triage approach to threatened species conservation was implemented in NSW through the state-wide *Saving Our Species* policy framework[208] and formalised in the recent *Biodiversity Conservation Act 2016* (NSW).[209] The NSW Act is the only conservation legislation in Australia to explicitly identify and enable prioritisation in conservation decision making.[210] The Act contemplates two new prioritisation tools. Firstly, a Biodiversity Conservation Program is envisaged, to create a framework for implementing threatened species and ecological community conservation priorities.[211] While the details of this Biodiversity Conservation Program are yet to be seen, the terminology used in this statutory provision, to 'create a framework', is weak.[212] Secondly, a Biodiversity Conservation Investment Strategy will 'specify guiding principles for (a) identifying priority investment areas, (b) investing in those areas and (c) mapping those areas, including in relation to existing conserved land.[213] The target of priority investment areas include many of interest for biodiversity adaptation, including 'core' biodiversity areas, state and regional biodiversity corridors, 'least protected ecosystems', and areas to meet the National Reserve System's comprehensive, adequate and representative protected area criteria.[214] The NSW legislative scheme is in its infancy but its implementation should be observed closely, particularly the development of criteria for triage decision making, as

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[206] McDonald et al, above n 63.
[207] Bottrill et al 2008, above n 199; Brown, Christopher J et al, 'Effective conservation requires clear objectives and prioritizing actions, not places or species' (2015) 112(32) *PNAS* E4342.
[208] Joseph, L, R Maloney and H Possingham, 'Optimal allocation of resources among threatened species: a Project Prioritization Protocol' (2009) 23(2) *Conservation Biology* 328; NSW Office of Environment and Heritage, 'Introducing Saving Our Species' (2013).
[209] Byron, Neil et al, *A review of biodiversity legislation in NSW: final report* (NSW Government, 2014) 54.
[210] With a statutory object 'to support and guide prioritised and strategic investment in biodiversity conservation', *Biodiversity Conservation Act 2016* (NSW) cl 1.3(i).
[211] *Biodiversity Conservation Act 2016* (NSW) cl 4.36(1)(a), (b).
[212] Such phrases are interposed to avoid a direct obligation to achieve the ultimate goal – the conservation outcome. An effective prioritisation framework should, ideally, be supported by strong legislative provisions that include a high level of specificity, ambition and enforceability.
[213] *Biodiversity Conservation Act 2016* (NSW) cl 5.1(2), cl 5.3(1)(a)-(c), (2).
[214] *Biodiversity Conservation Act 2016* (NSW) cl 5.3(5)(a)-(d).

climate change creates a growing imperative for conservation law and policy reform in other jurisdictions.[215]

Clear statutory criteria for prioritising conservation investment are fundamental to 'explicit, accountable and appropriate triage-based management',[216] and will be necessary to ensure that prioritisation processes do not contravene 'non-regression' standards[217] or undermine biodiversity adaptation under climate change.

(b) Implement rigorous standards to improve the process of decision making

Enforceable, directing principles in legislation can be used to improve decision-making standards for conservation.[218] Directing principles can govern the *process* of decision making by setting explicit criteria that a decision maker must take into account, rather than the scope of acceptable outcomes available in any particular case. Directing principles can also enhance accountability while allowing decision makers to tailor interventions to local conditions and use new management tools as they are developed over time.[219] For example, directing principles may impose obligations on decision makers to balance the ecological and social implications of their decisions, and require consideration of cumulative impacts and the adaptive capacity of species and ecosystems affected by relevant decisions.[220]

The *Climate Change Act 2017* (Vic) provides an interesting example of the potential content of directing principles that facilitate biodiversity adaptation. They are particularly interesting because, of course, the six directing principles set out in that Act were designed specifically to respond to the challenges of decision making under climate change.[221] The *Climate Change Act 2017* (Vic) includes a principle of *integrated decision making*, designed to ensure that all relevant climate considerations are examined, and that any measures adopted in response are cost-effective and proportionate to the climate-related

[215] The *Biodiversity Conservation Act 2016* (NSW) commenced in August 2017.
[216] Bottrill et al 2008, above n 199, 650.
[217] Discussion of non-regression in environmental law in this section, below.
[218] Directing principles expressed in legislation are a form of legal purpose that is distinct from the three legal design principles the subject of Section 4.3, see APEEL, above n 5, 5.
[219] Avoiding imposing rigid specifications about precise actions or outcomes required in any given scenario.
[220] Arnold and Gunderson, above n 192, 10428.
[221] *Climate Change Act 2017* (Vic) Part 4, s 20.

problems identified.[222] The integrated decision-making principle requires decision-making processes to integrate 'competing long-term, medium-term and short-term environmental, economic, health and other social considerations relating to climate change'.[223]

Another principle from the *Climate Change Act 2017* (Vic) of particular interest for this research, is that of *risk management*, which requires that decision-making processes be based on a careful evaluation of the 'best practicably available information' about the potential impacts of climate change.[224] The risk management principle seeks to 'avoid, wherever practicable, serious or irreversible damage resulting from climate change', and to assess, manage and allocate the risks and consequences of all options for a decision that are under consideration 'in a manner that is easily seen and understood and endeavouring to achieve best practice'.[225] Ensuring compliance with this kind of directing principle could bolster accountability for decisions about conservation under climate change, while ensuring that the range of adaptation-oriented decision options are not constrained by rigid legal provisions.

(c) Prohibit regression, distinguishing regressive reform from adaptive reform

Recent research has identified a growing international trend to relax or remove legal protections for biodiversity, and ongoing failures to implement and enforce key environmental obligations.[226] Particularly worrying is the rate at which such back-sliding, or 'systemic regression of environmental law to accommodate the wishes of influential interest groups',[227] is occurring in the developed world, including Australia.[228] The principle of non-regression, originating in international human rights law, has been proposed for adoption in environmental law to prevent governments from undermining or reversing strong environmental standards.[229] The principle is intended to create a barrier to

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[222] *Climate Change Act 2017* (Vic) s 24.
[223] *Climate Change Act 2017* (Vic) s 24.
[224] *Climate Change Act 2017* (Vic) s 25.
[225] *Climate Change Act 2017* (Vic) s 25(1).
[226] Chapron, Guillaume et al, 'Bolster legal boundaries to stay within planetary boundaries' (2017) 1 *Nature Ecology & Evolution* 86.
[227] Ibid 89.
[228] Ibid 88; Watson, JE et al, 'The performance and potential of protected areas' (2014) 515(7525) *Nature* 67, 71.
[229] Prieur, Michel, 'Non-Regression in Environmental Law' (2012) 5(2) *Surveys and Perspectives Integrating Environment and Society* 53; its opposite, 'progressive realisation', describes a requirement for continual

outright deregulation and repeal of environmental laws. It has also been identified as a way of defending against more subtle forms of regression, including underfunding or failing to implement environmental laws and prioritising other imperatives such as economic development.[230]

The principle of non-regression has been approved and adopted as a key principle of environmental law and sustainability by the IUCN,[231] and is represented in domestic legal frameworks around the world in a number of different ways. For example, the Ecuadorian constitution sets out a government pledge to 'strengthen the harmonization of national laws… in accordance with the principles of progressivity and non-regressivity'.[232] In other jurisdictions, the principle has been developed through jurisprudence, including in France where it has been described as the 'ratchet effect'.[233]

A key challenge for this legal design principle is how to determine whether a proposed reform constitutes 'progress' or 'regression'.[234] This question will become more complex as the climate changes. For example, climate change will trigger the need for high-risk conservation interventions, such as managed relocations; trade-offs, including between threatened species populations and critical ecological functions; and triage, to maximise the effect of limited conservation resources in the context of laws and policies that seek to 'preserve' everything.

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progress in the realisation of economic, social and cultural rights and improvement in their status in domestic law, International Network for Economic, Social & Cultural Rights, 'Progressive realisation and non-regression' <https://www.escr-net.org/resources/progressive-realisation-and-non-regression>.

[230] Prieur, above n 229; Chapron, above n 226, 89.

[231] IUCN, *Motion adopted at the World Conservation Congress, held in Hawai'i from 1-10 September 2016 – Reinforcing the principle of non-regression in environmental law and policy*, UN Doc WCC-2016-Res-082-EN (7 November 2016) <https://portals.iucn.org/congress/motion/082>.

[232] *Constitution of the Republic of Ecuador* (20 October 2008), ch 3, cl 3 [Georgetown University, Edmund A Walsh School of Foreign Service trans] <http://pdba.georgetown.edu/Constitutions/Ecuador/english08.html>; the Belgian Constitution expresses a similar principle as the 'standstill obligation', art 3, cited in Boyd DR, 'The effectiveness of Constitutional environmental rights' *Yale UNITAR workshop* (26-27 April 2013) 9 <https://environment.yale.edu/content/documents/00003438/Boyd-Effectiveness-of-Constitutional-Environmental-Rights.docx?1389969747>.

[233] Boyd, above n 232, 9, citing French and Belgian jurisprudence; Global Legal Observatory on Non-Regression <https://legalobservatorynonregression.wordpress.com/>.

[234] APEEL, above n 5, 38.

Clear criteria will be necessary to support the distinction between progressive and regressive law reform to avoid undermining proactive, adaptation-oriented conservation.[235] One criterion to identify a regressive law reform may require evidence about 'intended environmental outcomes', which would allow the justification of adaptive conservation while exposing regressive reforms that were not primarily for a conservation purpose.[236] Alternatively, as an exception to a strict rule against regression, evidence may be required of a 'compelling public interest'. Belgian courts have taken that approach, defining regression as a 'significant deterioration which cannot be justified by the underlying reasons of public interest'.[237] A criterion for determining that a proposed reform is *not* regressive could require evidence of the weight of independent, peer-reviewed research being in favour of that type of reform.

Non-regression could be implemented in Australia by requiring Parliaments to scrutinise all new legislation for regression against environmental legal standards and explicitly justify regressive reforms. This approach has been adopted for human rights in Victoria with the *Charter of Human Rights and Responsibilities Act 2006* ('Victorian Charter'). The Victorian Charter requires all legislation tabled in the Victorian Parliament to include a 'statement of compatibility' with human rights by the member presenting the Bill. That statement must identify whether the Bill is compatible with human rights and, if so, how it is compatible; and if any part of the Bill is incompatible, the nature and extent of that incompatibility.[238] Section 31 of the Victorian Charter allows the Parliament to expressly declare that the Bill has effect, even if it is incompatible with human rights, but requires a statement to Parliament 'explaining the exceptional circumstances that justify the inclusion

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[235] Ibid, citing the repeal of land clearing laws in Queensland, and the repeal of a national carbon pricing mechanism in Australia as clear examples of regressive legislative reform on this measure.

[236] In which case, the self-assessable codes recently introduced for land clearing in NSW would arguably be regressive, given their focus on streamlining clearing approval processes for the agricultural sector, *Local Land Services Amendment Act 2016* (NSW) Sch 5A, ss60Q ('allowable activities clearing' without the need for approval/authority) and 60S ('allowable activities clearing' when authorised by a landholder under a Land Management (Native Vegetation) Code); NSW, *Parliamentary Debates*, Legislative Council, 9 November 2016, (Niall Blair).

[237] Discussed in Lavrysen, L, 'Presentation of Aarhus-related cases of the Belgian Constitutional Court' (2007) 2 *Environmental Law Network International Review* 5, the public interest test was used in Belgium to prevent government weakening air and noise pollution standards to accommodate proposed motor racing events.

[238] *Charter of Human Rights and Responsibilities Act 2006* (Vic) s 28(3).

of the override declaration'.[239] This approach protects Parliamentary sovereignty while exposing legislation that is incompatible with human rights to increased transparency and political accountability.[240]

Legislation that would have the effect of reducing or undermining conservation standards could similarly be required, at the time that it is tabled in any Australian Parliament, to include an explicit 'statement of environmental regression'. This would increase the transparency of changes to environmental standards, and allow communities to hold governments to account in cases of regressive conservation law reform. Where a proposed reform could be defined as regressive but has been drafted to promote biodiversity adaptation, a Parliamentary statement justifying a declaration overriding the non-regression requirement could set out the reasons for that approach in detail. As with the Victorian Charter, a requirement for a 'statement of environmental regression' may reduce the likelihood of non-adaptive, regressive legal reforms being proposed in the first place.[241]

Principle 3: Prioritise adaptive management

The law is a complex adaptive system, in which conservation decisions and legal reforms inevitably have unintended consequences and trade-offs.[242] Climate change introduces additional uncertainties for the design and operation of law, as well as for the conservation of biodiversity.[243] As discussed at Section 4.2.3, above, the rapid, unpredictable and irreversible nature of many projected climate change effects will also 'negate the knowledge and baselines we have used in [the past]… making front-end decisions at best unreliable and at worst impossible'.[244] Adaptive management is almost universally

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[239] *Charter of Human Rights and Responsibilities Act 2006* (Vic) s 31(3).
[240] Williams, G, 'The Victorian *Charter of Human Rights and Responsibilities*: origins and scope' (2006) 30 *Melbourne University Law Review* 880, 899-900.
[241] Ibid 896.
[242] Ruhl, JB, 'Law's complexity: a primer' (2008) 24(4) *Georgia State University Law Review* 885; Garmestani, Ahjond S, Craig R Allen and Heriberto Cabezas, 'Panarchy, adaptive management and governance: policy options for building resilience' (2009) 87 *Nebraska Law Review* 1036.
[243] Ruhl, above n 242; Jones, Judith, 'Regulatory design for scientific uncertainty: acknowledging the diversity of approaches in environmental regulation and public administration' (2007) 19(3) *Journal of Environmental Law* 347.
[244] Fischman, Robert L and Jillian R Rountree, 'Adaptive management' in Michael B Gerrard and Katrina Fischer Kuh (eds), *The law of adaptation to climate change: U.S. and international aspects* (American Bar Association, 2012) 19, 36.

recommended as a characteristic of adaptive and effective environmental law[245] and governance[246] for responding to these fundamental decision-making challenges. Design principle 3 argues that adaptive management processes ought to be prioritised for adaptation-oriented conservation.

The key ideas underpinning adaptive management, such as 'learning while doing', systematic monitoring, and mandatory, periodic review and adjustment of laws, policies, decisions and management processes, 'provide a strong conceptual basis for evaluating and strengthening legal frameworks for climate change'.[247] Adaptive management offers a useful tool for reducing uncertainty, shifting the emphasis from upfront 'once and for all' decision making towards iterative decisions that can adjust to changing circumstances over time.[248] Adaptive management can also help to identify ineffective management interventions and inefficient allocation of funding,[249] both of which will be critical to maximising conservation resources as climate change exacerbates existing threats to Australian biodiversity.

Adaptive management has weaknesses, both in its existing implementation and its prospects for improving future adaptation-oriented conservation. For example, and despite its prominence in adaptation law scholarship, adaptive management is rarely mentioned explicitly in legal frameworks.[250] Indeed legal and institutional frameworks have often

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[245] Allen, Craig R and Ahjond Garmestani (eds), *Adaptive management of social-ecological systems* (Springer, 2015); Ruhl, JB and Robert L Fischman, 'Adaptive management in the courts' (2010) 95(2) *Minnesota Law Review* 424; Craig, above n 102.
[246] Eg Kenward, RE et al, 'Identifying governance strategies that effectively support ecosystem services, resource sustainability, and biodiversity' (2011) 108(13) *Proceedings of the National Academy of Sciences* 5308.
[247] Schramm and Fishman, above n 87, 491-2; Camacho, above n 153, 64-76; Ruhl, JB, 'General design principles for resilience and adaptive capacity in legal systems - with applications to climate change adaptation' (2011) 89 *North Carolina Law Review* 1373.
[248] Eg Ruhl, JB, 'Regulation by adaptive management: is it possible?' (2005) 7(1) *Minn J L Sci & Tech* 21; Lawler JJ et al 'Resource management in a changing and uncertain climate' (2010) 8(1) *Frontiers in Ecology and the Environment* 35; Kostyack, John and Dan Rohlf, 'Conserving endangered species in an era of global warming' (2008) 38 *ELR* 10203, 10209; Ruhl, above n 102, 413-418.
[249] Eg Walsh, JC et al, 'Integrating research, monitoring and management into an adaptive management framework to achieve effective conservation outcomes' (2012) 15(4) *Animal Conservation* 334; Scott, John K et al, *Weeds and climate change: supporting weed management adaptation, an AdaptNRM technical guide* (2014) 23 <www.AdaptNRM.org>.
[250] McDonald, Jan and Megan C Styles, 'Legal strategies for adaptive management under climate change' (2014) 26(1) *Journal of Environmental Law* 25.

been identified as adaptive management constraints or barriers.[251] Efforts to implement adaptive management have been criticised as 'ad hoc contingency planning more than …planned 'learning while doing'';[252] and clear examples of laws that successfully implement the process are rare.[253] It has the potential to be misused, including by allowing conservation agencies to 'duck difficult decisions'.[254] Further, traditional adaptive management approaches have tended to ignore social and normative changes over time[255] – which is particularly problematic for adaptation strategies such as managed relocation, that fundamentally challenge human values and expectations in conserving non-human species, ecological processes and ecosystem services.[256]

This design principle proposes that adaptive management be integrated more effectively into legal frameworks for conservation, as well as ensuring continual law, policy and project improvement through monitoring and adjustment over time. Given the substantial resources required to 'adaptively manage' all components of a conservation task, a strategic approach will likely be required in most cases. Strategic approaches have the potential to streamline adaptive management by ensuring that resources are targeted at learning that is possible, feasible and has the greatest potential to improve future decision making.[257] A strategic approach may require management agencies to identify a small number of key interventions that, when implemented, will be monitored and used to inform

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[251] Eg Benson, Melinda Harm and Courtney Schultz, 'Adaptive management and law' in Allen, Craig R and Ahjond Garmestani (eds), *Adaptive management of social-ecological systems* (Springer, 2015) 39.
[252] Ruhl and Fischman, above n 245, 426; McDonald and Styles, above n 250.
[253] Including because of limited legal definitions, tentative application by environmental agencies and conservative judicial treatment, McDonald and Styles, above n 250, 7-16.
[254] Fischman and Rountree, above n 244, 20; Gregory, R, D Ohlson and J Arvai, 'Deconstructing adaptive management: criteria for applications to environmental management' (2006) 16(6) *Ecological Applications* 2411, 2411.
[255] Maris, V and A Bechet, 'From adaptive management to adjustive management: a pragmatic account of biodiversity values' (2010) 24(4) *Conserv Biol* 966; Armitage D et al, 'Emerging concepts in adaptive management' in CR Allen, AS Garmestani (eds) *Adaptive Management of Social-Ecological Systems* (Springer, 2015) 235, 236.
[256] Eg Minteer, Ben A and James P Collins, 'Move it or lose it? The ecological ethics of relocating species under climate change' (2010) 20(7) *Ecological Applications* 1801; Schwartz, Mark W et al, 'Managed relocation: integrating the scientific, regulatory, and ethical challenges' (2012) 62(8) *BioScience* 732; particularly in cases when success is ambiguous, Game, Edward T et al, 'Conservation in a wicked complex world; challenges and solutions' (2014) 7(3) *Conservation Letters* 271; Armitage, D et al, 'Emerging concepts in adaptive management' in CR Allen, AS Garmestani (eds) *Adaptive Management of Social-Ecological Systems* (Springer, 2015) 235.
[257] Biber, Eric, 'Adaptive management and the future of environmental law' (2013) 46(4) *Akron Law Review* 933; Doremus, Holly et al, *Making good use of adaptive management* (Center for Progressive Reform White Paper No 1104, 2011).

management adjustments over time. Efforts to streamline adaptive management in this way are evident in some of the most recent protected area management plans in Australia, where two-to-three key management tasks are identified for regular and ongoing monitoring, with measurable criteria to determine whether management interventions are successful.[258] Conservation managers must also decide whether it is most feasible and/or valuable to implement *active* adaptive management, through experimentation and multiple interventions that allow comparison, or *passive* adaptive management, relying on historical information to develop a single 'best practice' strategy, which is tested by comparing actual results against predicted results and adjusted over time.[259]

Not every conservation decision or intervention will be amenable to adaptive management.[260] Considerations for selecting appropriate 'key interventions' for adaptive management include scale, agency or management priorities, timing, and potential barriers to learning.[261] For example, learning generated from adaptive management in a transboundary, landscape-scale protected area is unlikely to generate information directly applicable to local-scale and species-specific conservation interventions.[262] Institutional culture, conservation priorities and resourcing will affect the number and nature of the interventions that can be managed adaptively, as well as whether an active or passive approach should be adopted.[263] The time required to design, implement, monitor and analyse outcomes for most activities may be of particular relevance to conservation for biodiversity adaptation. Rapid climate changes will mean that some urgent, irreversible decisions – such as establishing a captive breeding population or choosing not to intervene to prevent a species' extinction – will not be able to wait for adaptive management to

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[258] See Chapter 6, Section 6.5.3.
[259] Biber, above n 257, 934; Williams, BK, 'Passive and active adaptive management: approaches and an example' (2011) 92(5) *J Environ Manage* 1371; McDonald and Styles, above n 250, 29-30.
[260] Eg Biber, above n 257; Doremus, Holly, 'Adaptive management as an information problem' (2010) 89 *North Carolina Law Review* 1455; Gregory, Ohlson and Arvai, above n 254.
[261] For an example of a high-level conceptual model for selecting conservation interventions, see Mitchell, M et al, 'Incorporating governance influences into social-ecological system models: a case study involving biodiversity conservation' (2015) 58(11) *Journal of Environmental Planning and Management* 1903; the Open Standards conservation planning approach could also be useful for this task, eg Moorcroft, H et al, 'Conservation planning in a cross-cultural context: the Wunambal Gaambera Healthy Country Project in the Kimberley, Western Australia' (2012) 13(1) *Ecological Management and Restoration* 16.
[262] Biber, above n 257, 940-1.
[263] Ibid 942-4.

reduce critical uncertainties or improve the information justifying the final decision.[264] Finally, problems of learning will arise in some cases, as climate changes render a resource so dynamic that uncertainty cannot be reduced through adaptive management, even if implemented perfectly.[265]

An important starting point for this design principle will be to introduce objects clauses and statutory indications of the value of monitoring and reporting on conservation actions over time. The *Biodiversity Conservation Act 2016* (NSW) is the only Australian statute to include an object clause along these lines, stating that one purpose of the Act is 'to support collating and sharing data, and monitoring and reporting on the status of biodiversity and the effectiveness of conservation actions'.[266] Legislative provisions in many jurisdictions impose obligations to undertake periodic reviews, including of protected area management plans;[267] threat abatement and wildlife conservation plans;[268] statutory lists of threatened species or ecological communities;[269] and in some cases decisions not to act, for example to *not* prepare a threat abatement plan for a listed threatening process.[270]

Gathering new information by monitoring and evaluating the effects of a decision is an essential precondition to effective, iterative decision making.[271] Monitoring and mandatory decision reviews are not, however, sufficient.[272] Legal and policy mechanisms must also be developed to facilitate iterative decision making, which encourages 'decisions to be made and revised repeatedly over time in response to new knowledge, accumulated experience, or changed conditions'.[273] Conservation legislation typically provides a discretion to vary statutory plans and instruments, if necessary, following mandatory reviews such as those

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[264] Ibid 941-2; Woinarski et al, above n 161.
[265] Biber, above n 257, 943-4.
[266] *Biodiversity Conservation Act 2016* (NSW) cl 1.3(e).
[267] See discussion in Chapter 6, Section 6.2.3.
[268] Eg EPBC Act s 279(2), s 294(2); *Flora and Fauna Guarantee Act 1988* (Vic) s 21, 24.
[269] Eg *Threatened Species Protection Act 1995* (Tas) s 13(6); EPBC Act s 184 gives the Environment Minister a discretion to amend statutory lists.
[270] EPBC Act s 270A(1)(b) the Minister must review the original decision within five years, and within five years of every subsequent decision not to prepare a plan.
[271] McDonald and Styles, above n 250, 42-3.
[272] McDonald and Styles, above n 250, 43.
[273] DeCaro, Daniel A et al, 'Legal and institutional foundations of adaptive environmental governance' (2017) 22(1) *Ecology and Society* 32; Parson, Edward A and Darshan Karwat, 'Sequential climate change policy' (2011) 2(5) *Wiley Interdisciplinary Reviews: Climate Change* 744.

described in the paragraph above.[274] The iterative potential of these provisions is undermined by significant funding constraints for periodic review and plan revision; limited or no obligations to vary a plan even if the results of the review indicate it is necessary; and the absence of any implications for failing to exercise a discretion to vary a plan, even when a review deems variation desirable or necessary. For protected area management planning, this means that many plans in Australia have never been reviewed, and some of them are more than two decades old.[275]

One way to overcome some of these challenges may be to impose an obligation to revise or update plans when they are reviewed unless the review indicates that revision is unnecessary. There are no examples of this kind of obligation in Australian conservation laws. Environmental triggers – pre-identified, measurable changes in environmental conditions – can also be used to initiate a review and revision process for conservation decisions, planning instruments and statutory policies.[276] 'Built-in' policy adjustments may be engaged by environmental triggers or thresholds, such as a proportionate decline in vegetation cover, unprecedented low levels of rainfall or rapid declines in species richness. Such triggers and thresholds can help to embed adaptation and learning as intentional components of a plan, policy or decision.[277]

While not every eventuality can be anticipated, certain climate-driven responses are plausible or already apparent, such as species redistribution, sea level rise and coastal erosion and ecological retreat. Explicitly identifying negotiated and acceptable management responses to a range of clearly articulated climate effects in conservation planning can speed up the process of responding to those effects. Built-in adjustments can also enhance transparency and avoid repeated, urgent and ad hoc revisions – 'smoothing'

[274] Eg EPBC Act s 279(3), s 294(2), (3); *Flora and Fauna Guarantee Act 1988* (Vic) s 17(4).
[275] Chapter 6.
[276] McDonald and Styles, above n 250, 45-49; Bhadwal, Suruchi, Stephen Barg and Darren Swanson, 'Automatic policy adjustment' in Darren Swanson and Suruchi Bhadwal (eds), *Creating adaptive policies: a guide for policy-making in an uncertain world* (Sage, 2009) 56.
[277] Bhadwal, Barg and Swanson, above n 276, 57.

the inevitable ecological and social transitions that climate adaptation will render necessary.[278]

4.4 Conclusion

One of the key climate challenges for conservation legal frameworks is the need to design and implement conservation law and policy in the context of ongoing environmental change. Legal frameworks must meet this challenge to have any chance of reducing and reversing the catastrophic rate and scale biodiversity loss over recent centuries.[279] Reforming conservation purposes will require a shift away from traditional ‘preservationist’ conservation paradigms. That reform process will create new champions and also new bases of resistance,[280] requiring ‘radical shifts in perspective for many conservation stakeholders’.[281] Camacho has suggested that a fundamental challenge for determining new legal purposes will be in deciding whether land managers should be ‘curators’, ‘gardeners’, ‘farmers’ or ‘trustees’ for the rich biodiversity that we have inherited.[282]

The three principles set out in this chapter can be used for assessing the capacity of existing laws to facilitate climate adaptation, and for guiding the design of new, adaptation-oriented legal frameworks. Both tasks are demonstrated in the following four chapters of this thesis, which apply the three legal design principles to establishing and managing the protected area estate (Chapters 5 and 6), enhancing landscape-scale connectivity (Chapters 5 to 8), reducing non-climatic stressors (Chapter 7), and implementing conservation introductions under climate change (Chapter 8).

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[278] Swanson, Darren et al, ‘Seven tools for creating adaptive policies’ (2010) 77(6) *Technological Forecasting and Social Change* 924; Bhadwal, Barg and Swanson, above n 276, 57-8.
[279] Secretariat of the Convention on Biological Diversity, *Global Biodiversity Outlook: A mid-term assessment of progress towards the implementation of the Strategic Plan for Biodiversity 2011-2020* (2014) <https://www.cbd.int/gbo/gbo4/publication/gbo4-en.pdf>; SotE 2016, above n 172.
[280] Eg Hagerman and Satterfield, above n 203; Batavia, Chelsea and Michael Paul Nelson, ‘Heroes or thieves? The ethical grounds for lingering concerns about new conservation’ (2017) 7(3) *Journal of Environmental Studies and Sciences* 394.
[281] Heller and Zavaleta, above n 42, 26; Shellenberger M and T Naudhaus, *The death of environmentalism: global warming politics in a post-environmental world*, (2015) 7; Stein et al, above n 79, 505.
[282] Camacho, above n 57, 26.

Chapter 5 Expand the protected area estate

5.1 Introduction

The primary research question for this thesis is: *How can Australia's legal frameworks for biodiversity conservation facilitate adaptation as the climate changes?* The first step in answering this question was to identify the most commonly recommended strategies for facilitating biodiversity adaptation.[1] Chapter 3 then took on the task of detailing the key characteristics of each strategy, drawing on literature from the conservation sciences.[2] Chapter 4 then shifted the focus from the science behind the adaptation strategies, to their broad, legal context, analysing the overarching purposes of conservation laws in Australia. Chapter 4 demonstrated potential support for adaptation-oriented conservation in the purposes expressed in Australian laws. However, that chapter also highlighted challenges for biodiversity adaptation in conservation laws, particularly as a result of underpinning paradigms that presume environmental 'stationarity', idealise nature that is 'untouched' by humans, and fragment conservation approaches by prioritising 'pieces and pockets' of nature.[3]

Chapter 5 is the first of four chapters that narrow the focus of this thesis, from overarching legal purposes to the specific implementation of each adaptation strategy. This chapter provides a detailed analysis of Australian laws and policies for the protected area and connectivity strategies.[4] It specifically focuses on the legal framework for *expanding* Australia's protected area estate and improving appropriate, landscape-scale connectivity.[5] Questions about how best to *enhance* the management of Australia's protected area estate to promote adaptation and connectivity are dealt with separately, in Chapter 6.

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[1] A task that was introduced in Chapter 1, and the justification and methodology for its completion was detailed in Chapter 2, both in answer to research question (RQ)I: *What conservation strategies, discussed in the international biodiversity conservation literature, are considered the most important for an adaptation-oriented approach to biodiversity conservation?*
[2] In answer to RQII: *What does the literature suggest are the key characteristics of these strategies for enhancing biodiversity adaptation outcomes?*
[3] Chapter 4, Section 4.2.3.
[4] The other strategy-specific chapters are Chapter 6 (protected area strategy: management), 7 (non-climatic stressors strategy) and 8 (*ex situ* strategy), with the connectivity strategy forming a component of the analysis in each.
[5] To answer RQIII: *To what extent are these strategies currently represented in Australia's legal frameworks for biodiversity conservation?*

Rapidly increasing the size, quality and diversity of the terrestrial protected area estate, which in Australia is known as the National Reserve System ('NRS'), is widely recognised as a critical strategy for biodiversity adaptation.[6] It is also a 'no-regrets' strategy,[7] because it can be implemented despite a lack of detailed information about ecological interactions and precise, local or regional climate impacts.[8] Expanding the NRS can improve conservation outcomes under existing conditions, provide multiple benefits for species, ecosystems and human communities, and enhance the potential for biodiversity to persist under future climatic conditions.[9] The climate adaptation benefits of an expanded reserve estate include habitat provision for species redistributing as the climate changes.[10] Protected areas can also offer a 'safety net' of large-scale, intact habitat and climate refugia for the many species, habitats and ecosystems that will not be the subject of proactive conservation strategies such as managed relocations.[11] They provide the 'core elements of the more connected, dynamic [and novel] landscapes and seascapes'[12] that will emerge as climate change triggers ecosystem reassembly. Realising the goals of an adaptation-oriented NRS – including facilitating large-scale landscape diversity, appropriate regional and continental connectivity and adaptable, well-functioning

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[6] Heller, Nicole E and Erika S Zavaleta, 'Biodiversity management in the face of climate change: a review of 22 years of recommendations' (2009) 142(1) *Biological Conservation* 14; Mawdsley, JR, R O'Malley and DS Ojima, 'A review of climate-change adaptation strategies for wildlife management and biodiversity conservation' (2009) 23(5) *Conserv Biol* 1080; Dunlop, Michael et al, *The implications of climate change for biodiversity conservation and the National Reserve System* (Final synthesis report prepared for the Australian Government, CSIRO Climate Adaptation Flagship, 2012); Chapter 3, Section 3.3.1.

[7] Craig, Robin K., '"Stationarity is dead" - long live transformation: five principles for climate change adaptation law' (2010) 34(1) *Harvard Environmental Law Review* 9, 67.

[8] Dunlop, Michael et al, *Implications for policymakers: climate change, biodiversity conservation and the National Reserve System* (CSIRO Climate Adaptation Flagship, 2012) 7.

[9] Chapter 3, Section 3.3.1.

[10] Bonebrake, Timothy C et al, 'Managing consequences of climate-driven species redistribution requires integration of ecology, conservation and social science' (2017) 93(1) *Biological Reviews* 284; *eg* 98% of species that have already shifted their distribution as a result of climate change have disproportionately colonised protected areas at the leading edge of their range, Thomas, Chris D et al 'Protected areas facilitate species' range extensions' (2012) 109 *PNAS* 35.

[11] Chapter 8; Butchart, Stuart HM et al, 'Protecting important sites for biodiversity contributes to meeting global conservation targets' (2012) 7(3) *PLoS ONE* e32529; Geldmann, J et al 'Effectiveness of terrestrial protected areas in reducing habitat loss and population declines' (2013) 161 *Biol. Conserv* 230.

[12] Steffen, W et al, *Australia's biodiversity and climate change: a strategic assessment of the vulnerability of Australia's biodiversity to climate change* (Biodiversity and Natural Resource Management Adaptation Team, Commonwealth Department of Climate Change, 2009) 168.

ecosystems[13] – will require a broader perspective that looks both within and beyond its borders.

Australia's conservation laws provide a strong starting point for developing a climate-ready network of protected areas. Section 5.2 details the legislative and policy context for identifying and establishing new protected areas, setting the context for the discussion that follows. This chapter draws particularly on examples from Commonwealth, Victorian and Tasmanian legal frameworks and interviews with protected area stakeholders, taking the 'nested' approach foreshadowed in Chapter 2. This nested approach highlights the practical operation of a complex web of protected area laws, policies and actors. Having established the legal context, Section 5.3 analyses protected area laws and policies to identify limitations for facilitating biodiversity adaptation.[14] This is an important task because the limitations identified in this analysis are both legal – including a failure to articulate and respond to the challenges of climate change for conservation in Australia – and practical – including a failure to fully implement existing legal commitments. Section 5.4 presents a series of legal and policy reforms. It begins with recommendations to improve the effectiveness of the Connectivity Strategy for facilitating adaptation across landscapes and ecosystems as the NRS is expanded. The three legal design principles set out in Chapter 4 – 'adopting more proactive approaches' to conservation, 'promoting accountable flexibility' and 'prioritising adaptive management' – are then used to frame recommendations for the Protected Area Strategy.[15]

5.2 Legal framework for expanding and enhancing the NRS

This section investigates how legal frameworks support expanding the NRS in Australia, including by prioritising new areas for inclusion; creating legal tools for establishing and designating new protected areas; and maintaining the integrity of the NRS through enforcement mechanisms. To meet international targets for protected area expansion, set

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[13] Ibid 154.
[14] To answer RQIV: *To what extent do Australian legal frameworks for conservation hinder or promote the effective implementation of these strategies?*
[15] To answer RQV: *How can Australian law be reformed to improve the representation and implementation of these strategies?*

under the Convention on Biological Diversity 1992 (‘CBD’),[16] the Australian Government committed to reserve 17% of Australian terrestrial bioregions by 2020.[17] To implement this commitment, the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (‘EPBC Act’) and legislation in each Australian state and territory support the task of conserving new protected areas into the NRS. An NRS protected area must meet the International Union for the Conservation of Nature (‘IUCN’) protected area definition: to be conserved in perpetuity by legal or other effective means; contribute to the scientific and strategic priorities of the NRS; and be managed to protect and maintain biological diversity according to one of the categories of protected area identified by the IUCN.[18] In some cases, legal frameworks for conservation also provide for designation of connectivity and buffer zones within *and* outside the NRS, a crucial task for facilitating adaptation across the Australian continent as the climate changes.

5.2.1 Identifying new protected areas

The NRS is a nationally-consistent network of formally protected areas.[19] As at August 2017, the NRS comprised more than 10,500 individual protected areas, covering almost 20% of the Australian landmass.[20] The NRS includes Commonwealth and state and territory, community, private and Indigenous-owned and managed areas.[21] Governance of the NRS includes government and community protected area management, as well as private, indigenous and co-management arrangements.[22] Local government schemes

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[16] *Convention on Biological Diversity*, opened for signature 5 June 1992, 1760 UNTS 79 (entered into force 29 December 1993) (‘CBD’), ‘Aichi Biodiversity Targets’, adopted as part of the *Strategic Plan for Biodiversity 2011-2020* by the Conference of the Parties to the CBD, *Decision of the COP in its Tenth Meeting, Held in Nagoya from 18-29 October 2010 – Agenda item 4.4,* UN Doc UNEP/CBD/COP/DEC/X/2 (29 October 2010).
[17] Australian Department of the Environment and Energy, *National Reserve System Protected Area Requirements*, <www.environment.gov.au/parks/nrs/about/management.html>.
[18] Dudley, N (ed), *IUCN guidelines for applying protected area management categories* (IUCN Publications Services, 2008) 8; Australian Natural Resource Management Ministerial Council, *Australia's Biodiversity Conservation Strategy 2010-2030* (2010) (‘Biodiversity Conservation Strategy’) 9; Australian and New Zealand Environment Conservation Council, *Australian Guidelines for Establishing the National Reserve System* (Australian Government, 1999) (‘NRS Guidelines’) 5.
[19] NRS Guidelines, above n 18.
[20] Australian Department of the Environment and Energy, ‘CAPAD 2016’ <www.environment.gov.au/land/nrs> (‘CAPAD 2016’).
[21] Ibid, with Indigenous Protected Areas accounting for nearly 45% of the NRS and covering more than 8% of the Australian landmass.
[22] Australian Department of the Environment and Energy ‘About the NRS’ <http://www.environment.gov.au/land/nrs/about-nrs/ownership>.

complement the NRS by conserving small areas of habitat or ecological communities critical for local biodiversity and broader, landscape connectivity.[23]

The national strategy for expanding the NRS ('NRS Strategy') identifies three strategic priorities. These priorities guide Australian government investment in support of achieving a scientifically robust reserve system, and in particular, a reserve system that is:

- *Comprehensive*: incorporating a full range of regional ecosystems within and across Interim Biogeographic Regionalisation for Australia ('IBRA') bioregions;

- *Adequate*: to ensure ecological viability and the integrity of species populations; and

- *Representative*: incorporating regional variability within ecosystems, including within IBRA sub-regions.[24]

Forest ecosystems, and some woodland ecosystems, are excluded from the ambit of the NRS Strategy and conserved instead under Regional Forest Agreements ('RFAs').[25] RFAs are 20-year agreements between Commonwealth and state governments that seek to balance sustainable management, productive use and conservation of native and plantation forests, while achieving resource security for forestry industries.[26] RFA forestry protected areas implement a modified version of the Comprehensive, Adequate and Representative ('CAR') criteria, known as the National Forest Reserve Criteria or 'JANIS criteria'.[27]

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[23] McCormack, Phillipa and Jan McDonald, 'Adaptation strategies for biodiversity conservation: has Australian law got what it takes?' (2014) 31 *Environmental and Planning Law Journal* 114; voluntary conservation agreement programs run by some South East Queensland local councils under the *Land Titles Act 1994* (Qld) also incorporate areas into the NRS; interview #34 (local government); Berwick, Mike, *National Local Government Biodiversity Strategy* (Australian Local Government Association and Biological Diversity Advisory Council, 1998) <http://alga.asn.au/site/misc/alga/downloads/publications/Bio_diversity_strategy.pdf>.
[24] Natural Resource Management Ministerial Council, *Australia's Strategy for the National Reserve System 2009–2030* (2010) 64-5.
[25] NRS Guidelines, above n 18; analysis of the complementary national system of Marine Protected Areas is beyond the scope of this thesis.
[26] In accordance with the Council of Australian Governments, *National Forest Policy Statement* (2nd ed, 1995); Department of Agriculture and Water Resources, *Regional Forest Agreements – an overview and history* (2015) 1-2 ('RFA overview').
[27] Joint Australian and New Zealand Environment Conservation Council / Ministerial Council on Forestry Fisheries and Aquaculture, National Forest Policy Statement Implementation Subcommittee ('JANIS'),

The JANIS criteria set a goal of conserving 15% of pre-1750 distributions of every forest type on both private and public land. Historical clearing means that this goal is far greater for many forest ecosystems than conserving 15% of their current distribution. Indeed, for some forest types this represents *every* example of extant communities.[28] The JANIS criteria also set ambitious goals of 90% or more of high quality wilderness forests and 100% of remnant rare and endangered forest ecosystems including rare old-growth, on both public and privately owned land.[29] These criteria were developed nearly 30 years ago but have a patchy implementation record.[30] For example, only 30% of the area of Tasmanian land required to meet the JANIS criteria had been reserved by 2007, and an independent review estimated that up to 40% of the area reserved at that time constituted 'bycatch' of non-target forest communities rather than the 'high conservation value' forest intended.[31]

Despite shortcomings in its implementation, the JANIS criteria have been identified as 'one of the most thorough and integrated approaches to reserve planning in the world'.[32] They have been adopted in independent, triennial assessments of the NRS, measuring Australia's progress in conserving terrestrial ecosystems and species habitat.[33] The Tasmanian Land Conservancy[34] and the Victorian protected area statutory authority Trust for Nature have also adopted a modified version of the JANIS criteria to direct their acquisition of new, private protected areas. The Tasmanian Land Conservancy uses the JANIS criteria to support its efforts to achieve a 'world class reserve system' in Tasmania,

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Nationally Agreed Criteria for the Establishment of a [CAR] Reserve System for Forests in Australia (1997) ('JANIS criteria 1997').

28 Taylor, Martin FJ, James A Fitzsimons and Paul S Sattler, *Building nature's safety net 2014: a decade of protected area achievements in Australia* (WWF-Australia, 2014) 62.

29 Summarised by Australian Department of Agriculture and Water Resources, 'Protecting our forest environment' <www.agriculture.gov.au/forestry/policies/rfa/about/protecting-environment>, the JANIS criteria provided, for the first time, for the conservation of 100% of old-growth forests that are rare or depleted.

30 Feehely, J, N Hammond-Deakin and F Millner, *One stop chop: how Regional Forest Agreements streamline environmental destruction* (Lawyers for Forests, 2013).

31 Gilligan, Brian and Syneca Consulting Pty Ltd, *Review and evaluation of the Tasmanian Private Forest Reserves Program* (Independent report prepared for the Tasmanian Department of Primary Industries and Water, 2007) 28.

32 Tasmanian Land Conservancy, *Conservation planning: overview* (2015) 1; RFA overview, above n 26, 6.

33 Taylor, Fitzsimons and Sattler, above n 28, 61; Taylor, Martin FJ et al, *Building nature's safety net 2011: the state of protected areas for Australia's ecosystems and wildlife* (WWF-Australia, 2011) 16-18.

34 A Tasmanian, non-government conservation organisation with an NRS private protected area estate that includes Tasmanian terrestrial and freshwater ecosystems.

supplementing the scaled JANIS approach to remnant and endangered ecosystems with additional climate adaptation considerations such as climate refugia.[35]

5.2.2 Establishing new protected areas

The EPBC Act and protected area legislation in each state and territory create legal processes for establishing new protected areas.[36] Each new NRS site must be *declared* to be a protected area and *designated* into one of a range of statutory reserve categories. Legislation empowers governments to declare land that they own or lease to be a protected area;[37] to lease or purchase land for the purpose of declaring it a protected area;[38] or, with the landholder's consent, to declare a protected area over land held by a statutory authority or local government.[39] Governments may also negotiate conservation covenants with private landholders, which impose management obligations for natural values on private land.[40] Conservation covenants are recorded against a property's title, binding successors in title to conservation management obligations in perpetuity.[41] Uniquely, Indigenous Protected Areas ('IPAs') are not established under legislation, despite making up a large, and growing, proportion of the NRS.[42] IPAs are areas of Indigenous owned or managed land or sea country that are voluntarily dedicated to conservation,[43] and their vast scale has been instrumental in helping Australia meet its international protected area targets.[44]

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[35] Tasmanian Land Conservancy, above n 32, 1, 3; Tasmanian Land Conservancy, 'World class reserve system for Tasmania' <http://tasland.org.au/projects/world-class-reserve-system-for-tasmania/>.
[36] See eg *National Parks Act 1975* (Vic), *Crown Land (Reserves) Act 1978* (Vic); *Nature Conservation Act 2002* (Tas), *Crown Lands Act 1976* (Tas); *National Parks and Wildlife Act 1972* (SA); *Nature Conservation Act 1992* (Qld).
[37] Eg EPBC Act s 344, *Nature Conservation Act 2002* (Tas) s 11(1).
[38] EPBC Act s 344(2) Commonwealth may require state or territory consent; *Nature Conservation Act 2002* (Tas) s 14, 15.
[39] Eg *Nature Conservation Act 2002* (Tas) s 12, 13(5).
[40] Eg EPBC Act s 306; *Nature Conservation Act 2002* (Tas) s 34.
[41] NRS Guidelines, above n 18; eg EPBC Act s 307; *Nature Conservation Act 2002* (Tas) s 22; Booth, Carol and Cristina Romero, 'Private and protected: Where to for conservation covenanting' (2014) 51(1) *Wildlife Australia* 32, 33; Hannah, Lee et al, 'Protected area needs in a changing climate' (2007) 5(3) *Front Ecol Environ* 131, 131.
[42] 74 IPAs make up more than 45% of the NRS, CAPAD 2016, above n 20.
[43] Australian Department of the Prime Minister and Cabinet, *Australia's Indigenous Protected Areas: factsheet* (15 October 2015) 1.
[44] CAPAD 2016, above n 20; along with recent growth in large-scale private protected areas, eg the Australian Wildlife Conservancy, Bush Heritage Australia, and The Nature Conservancy have added 2 million hectares to the NRS over the past 20 years, Morton, Steve, Andy Sheppard and Mark Lonsdale (eds), *Biodiversity: science and solutions for Australia* (CSIRO Publishing, 2014) 73; IPAs and private protected areas also contribute significant diversity, flexibility and affordability to the network, Pasquini L et

In some jurisdictions, statutory authorities facilitate expansion of the protected area estate on private land, such as Victoria's Trust for Nature, which is established under the *Victorian Conservation Trust Act 1972*. The Trust can receive gifts and bequests of money and property and acquire and dispose of real property, including to preserve 'ecologically significant' areas, areas 'of natural interest or beauty' and to conserve wildlife and native plants.[45] The Trust can also enter into covenants binding landowners 'as to the development or use of the land or any part thereof or the conservation or care of any' of the land.[46] The Trust's legislation also empowers the Trust to set aside land tax or local government rate obligations for covenanted properties.[47]

In each jurisdiction, when a new area is declared it is also designated into a statutory protected area category.[48] These categories define the purposes for which the protected area was declared and for which it will be managed.[49] For example, Commonwealth reserves must be designated under the EPBC Act into one of seven IUCN protected area categories.[50] Each IUCN category has the primary objective of conserving nature but they range from category IA, 'strict nature reserves' through to category VI, where land is managed for both conservation and human habitation or non-industrial resource uses.[51] The IUCN protected area categories promote international consistency and set standards for generating and reporting on protected area data.[52]

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al, 'The establishment of large private nature reserves by conservation NGOs: key factors for successful implementation' (2011) 45(03) *Oryx* 373, 373.

[45] *Victorian Conservation Trust Act 1972* (Vic) s 3.

[46] Ibid s 3A; Trust for Nature has registered more than 1,300 perpetual conservation covenants on private land since 1978, Trust for Nature, 'About us' <http://www.trustfornature.org.au/about-us/>.

[47] Ibid s 3B.

[48] Eg *Nature Conservation Act 2002* (Tas) Part 3; EPBC Act s 347; *National Parks Act 1975* (Vic) s 17.

[49] Protected area management is the subject of detailed consideration in Chapter 6.

[50] EPBC Act s 346(1)(e); Environment Protection and Biodiversity Conservation Regulations 2000 ('EPBC Regs') regs 10.3H, 10.04; the Australian Government's jurisdiction to establish protected areas is Constitutionally limited to Commonwealth managed land and, as a result, the vast majority of public protected areas in Australia are state owned and managed, CAPAD 2016, above n 20, 'National' *cf* 'Commonwealth' summaries.

[51] Dudley, above n 18, 10; Lausche, Barbara, *IUCN guidelines for protected areas legislation* (IUCN, 2011); Bishop, Kevin et al, *Speaking a common language: the uses and performance of the IUCN system of management categories for protected areas* (IUCN, 2004); Dudley et al, 'The revised IUCN protected area management categories: the debate and ways forward' (2010) 44(4) *Oryx* 485.

[52] Bishop, above n 51.

No state legislation creates an obligation to apply the IUCN categories but, in practice, state protected areas are assigned to an IUCN category for national reporting purposes.[53] Comparing statutory protected area categories across states is otherwise difficult. The only consistent category title across all jurisdictions is 'national park', but even that term is defined in different ways; with the Queensland *Nature Conservation Act 1992*, for example, creating five separate 'types' of national park.[54] The *Nature Conservation Act 2002* (Tas) lists categories that include national parks and State reserves, game reserves and nature recreation areas, and on private land, private sanctuaries and nature reserves.[55] In Victoria, categories include national parks, state parks, wilderness areas, and 'other parks', defined individually by site-specific names.[56]

Different states also take different legislative drafting approaches to defining and distinguishing each category. The *Nature Conservation Act 2002* (Tas) sets out a series of 'values' that must be possessed by protected areas in each category, and 'purposes' for which areas in each category must be reserved.[57] The strictest conservation standards apply to nature reserves[58] which must contain natural values that contribute to natural biological or geological diversity or both, and 'are unique, important or have representative value'.[59] The 'purposes of reservation' for a nature reserve must be to conserve that natural diversity and those natural values.[60] By contrast, in Victoria, the *National Parks Act 1975* defines a

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[53] CAPAD 2016, above n 20; although the categories are applied inconsistently at the state level, Taylor, MFJ, *Building nature's safety net 2016: the state of Australian terrestrial protected areas 2010-2016* (WWF-Australia, 2017) 14.
[54] *Nature Conservation Act 1992* (Qld) s 14: national parks, national parks (scientific), national parks (Aboriginal land), national parks (Torres Strait Islander land) and national parks (Cape York Peninsula Aboriginal land).
[55] *Nature Conservation Act 2002* (Tas) s 16.
[56] *National Parks Act 1975* (Vic) Sch 3 'other parks', eg Beechworth Historic Park, Discovery Bay Coastal Park, Haining Park and Langwarrin Flora and Fauna Reserve.
[57] Or that or it 'possesses the values specified' and 'would promote the better management or more effective use of that land', *Nature Conservation Act 2002* (Tas) Sch 1.
[58] All Tasmanian national parks are currently categorised as IUCN category II, while most nature reserves are categorised as IUCN category IA (with the exception of a small number in IUCN category IV or V), CAPAD 2016, above n 20, 'Tasmania' summary.
[59] *Nature Conservation Act 2002* (Tas) Sch 1, item 3, column 2.
[60] *Nature Conservation Act 2002* (Tas) Sch 1, item 3, column 3; every other class of reserve balances conservation with sustainable use or recreation, eg to classify as a state reserve, an area must contain 'significant natural landscapes', 'natural features' or 'sites, objects or places of significance to Aboriginal people', and the purpose of reservation must be to protect and maintain those values while providing for ecologically sustainable recreation, *Nature Conservation Act 2002* (Tas) Sch 1, item 2; of course, the balance is struck at different points eg the purposes of a regional reserve include '…the development of mineral

protected area's category by including it in one of the Act's category-specific schedules. That is, areas described in *Schedule Two – State Parks* are deemed to be state parks.[61] The substantive provisions of the *National Parks Act 1975* (Vic) require that each category of park is 'controlled and managed in accordance with the objects of this Act' and in accordance with purposes specific to each category. For example, each wilderness park must be 'controlled and managed …in a manner that will protect and enhance the park as a wilderness' by preserving and protecting the natural environment 'including indigenous flora and fauna and features of ecological, geological or scenic significance'.[62]

Government policy and private initiatives also protect native vegetation and wildlife habitat outside of the NRS,[63] including through:

- private and public stewardship payments for habitat conservation, private protected area acquisitions under 'rolling fund' arrangements, and opt-in conservation covenants on private land;
- BioBanking, BushTender and other market mechanisms for conserving land;[64] and
- local government community protected areas and biodiversity, habitat and conservation overlays in planning schemes.[65]

These conservation programmes contribute to expanding and enhancing the health and diversity of ecosystems conserved in NRS protected areas and will play a critical role in promoting the adaptive capacity of formal protected areas as the climate changes.[66]

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deposits in the area of land, and the controlled use of other natural resources of that area of land…while protecting and maintaining… natural and cultural values', item 7, column 3.

[61] Eg *National Parks Act 1975* (Vic) s 17(1) provides that '[e]ach area of land described in a part of Sch 2 is, for the purposes of this Act, a national park under the name specified in that part'; *National Parks Act 1975* (Vic) ss 17A, 21B.

[62] *National Parks Act 1975* (Vic) s 17A(2)(a)(i).

[63] Collaborative public/private initiatives such as the Tasmanian *Private Land Conservation Program* operate alongside the formal protected area legal framework and can be very successful in establishing new protected areas, Tasmanian Department of Primary Industries, Parks, Water and the Environment ('DPIPWE'), 'Private land conservation program' <http://dpipwe.tas.gov.au/conservation/conservation-on-private-land/private-land-conservation-program>.

[64] Victorian Department of Sustainability and the Environment, *EcoMarkets: valuing our environment* (2008) 9.

[65] Kelly, Andrew HH, *The role of local government in the conservation of biodiversity* (PhD thesis, University of Wollongong, 2004) <http://ro.uow.edu.au/cgi/viewcontent.cgi?article=1386&context=theses>.

5.2.3 Enforcement mechanisms

Legislation creates a range of enforcement mechanisms to maintain the integrity of the NRS on private and public land. Interim protection may be afforded in some cases, to prevent damage to the natural or cultural values of an area between its identification as a potential protected area, and confirmation of its NRS status.[67] More commonly, Commonwealth and state legislation prohibit actions that would harm the environment within a protected area once it is reserved into the NRS. For example, unless authorised by a management plan, legislation prohibits: 'taking' or killing a native species,[68] destroying or removing vegetation,[69] and introducing non-native species to a protected area.[70] Legislation may impose civil and/or criminal penalties, including imprisonment.[71] For example, cutting down or destroying a tree on reserved land in Tasmania can attract a fine of up to 500 penalty units or up to two years imprisonment;[72] and causing death to native species in a Commonwealth reserve can attract up to two years imprisonment or a fine of up to 1,000 penalty units.[73] Some legislation also prohibits actions that contravene a conservation covenant on private land.[74] Effective enforcement of conservation laws in protected areas is a key measure of the effectiveness of a protected area network, but enforcement can be affected by institutional capacity, resourcing and changes in political support.[75]

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66 Laurance, WF et al, 'Averting biodiversity collapse in tropical forest protected areas' (2012) 489(7415) *Nature* 290.

67 *Richardson v Forestry Commission* (1988) 164 CLR 261, in which interim protection was upheld for an area being considered for world heritage listing.

68 Eg EPBC Act s 354A(1); National Parks and Reserved Land Regulations 2009 (Tas) reg 6(1); National Parks Regulations 2013 (Vic) reg 23.

69 Eg NPRMA (Tas) s 36; National Parks and Reserved Land Regulations 2009 (Tas) reg 4(1); *National Parks Act 1975* (Vic) s 44A; National Parks Regulations 2013 (Vic) reg 48.

70 Eg EPBC Regs reg 12.19(1), 12.20(1); National Parks and Reserved Land Regulations 2009 (Tas), reg 4(6), 7; National Parks Regulations 2013 (Vic) Part 5, regs 51, 52, 56.

71 Civil penalties may be applied for the purposes of both specific and general deterrence, eg *Minister for Sustainability, Environment, Water, Population and Communities v De Bono* [2012] FCA 643, [49], [54]; *Minister for the Environment and Heritage v Greentree* (No 3) (2004) 136 LGERA 89, [69]–[70], [81].

72 *Nature Conservation Act 2002* (Tas) s 36; National Parks and Reserved Land Regulations 2009 (Tas) offences, especially Part 2.

73 EPBC Act s 354A(1); a range of offences in Commonwealth areas are also specified in the EPBC Regs, eg EPBC Regs Part 12, 'Activities in Commonwealth Reserves'

74 *Eg Nature Conservation Act 2002* (Tas) s 46(1).

75 Stolton, S and N Dudley, *METT handbook: a guide to using the Management Effectiveness Tracking Tool (METT)* (WWF-UK, 2016) 15, 38; Hockings M, F Leverington and C Cook, 'Protected area management

5.2.4 Promoting connectivity through NRS expansion

Landscape fragmentation can cause substantial ecological change,[76] and it constitutes one of the greatest threats to biodiversity, worldwide.[77] The adaptation strategy of enhancing connectivity is introduced in Chapter 3, and includes conserving, restoring or creating habitat corridors, stepping stones and buffer zones around protected areas. The goal of connecting these areas is to reduce or address the harm caused by fragmentation, including by creating independent adaptation pathways, reducing non-climatic stressors, facilitating ecological health and linking ecosystem processes such as watersheds to enhance adaptive capacity.[78]

Conservation legislation in some jurisdictions may indirectly facilitate connectivity. For example, land that adjoins an NRS protected area in Tasmania may be designated as a reserve if its designation would promote better management of the original protected area, creating a legislative mechanism to conserve buffer zones.[79] Buffer zones moderate ‘the effect of intensive land use adjacent to [a] protected area, building resilience and providing opportunities to enhance its ecological and functional links to nearby habitat’.[80] However, this provision requires a proposed buffer zone to deliver conservation benefits *now*, rather than at some time in the future, constraining its use for climate adaptation.[81] The *Heritage Rivers Act 1992* (Vic) promotes freshwater connectivity and unimpeded flows in declared

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effectiveness’ in GL Worboys et al (eds) *Protected area governance and management* (ANU Press, 2015) 889.

[76] Donald, Paul F and Andy D Evans, ‘Habitat connectivity and matrix restoration: the wider implications of agri-environment schemes’ (2006) 43 *Journal of Applied Ecology* 209, 211; *cf* Mitchell, MG et al, ‘Reframing landscape fragmentation's effects on ecosystem services’ (2015) 30(4) *Trends in Ecology and Evolution* 190.

[77] Gibson, Luke et al, ‘Near-complete extinction of native small mammal fauna 25 years after forest fragmentation’ (2013) 341(6153) *Science* 1508; Laurance et al, above n 66; even very large habitat fragments can be ‘profoundly influenced’ by the quality of surrounding land uses and benefit from ‘edge-softening’, Donald and Evans, above n 76, 211-2; Buckley, Ralf, ‘World wild web: funding connectivity conservation under climate change’ (2008) 9(3&4) *Biodiversity* 71, 74.

[78] Chapter 3, Section 3.3.2; Fitzsimons, JA et al (eds), *Linking Australia’s landscapes: lessons and opportunities from large-scale conservation networks* (CSIRO Publishing, 2013); Worboys G, W Francis and M Lockwood (eds), *Connectivity conservation management: a global guide* (Earthscan, 2010) 4-6.

[79] *Nature Conservation Act 2002* (Tas) s 16; though the provision does not appear to have ever been used, in practice.

[80] McCormack and McDonald, above n 23, 126.

[81] *Nature Conservation Act 2002* (Tas) s 16; ibid 127; *National Parks Act 1975* (Vic) s 19E also allows the government to acquire and managed leases over land adjacent to existing reserves if that land is ‘suitable to be part of the park to which it is adjacent’.

'heritage river areas' and 'natural catchment areas'[82] by prohibiting certain land and water uses such as river impoundment developments and native vegetation clearing.[83] The Act facilitates conservation of riparian buffer zones by preventing the transfer or disposal of public land in a declared area,[84] including for up to 200m on either side of a river.[85] Heritage river areas and natural catchment areas operate as statutory overlays, and 17 such areas are incorporated in the NRS as public protected areas as a result of their underlying reserve tenure.[86]

Indirect legal and policy provisions for buffer zones in Australia may also be found in statutory recovery plans[87] and protected area management plans;[88] weed management legislation;[89] and instruments governing the conduct of forestry operations.[90] These instruments typically do not contemplate the adaptation benefits of connected habitat or the devastating impacts of projected climate change for species and ecological processes.[91] However, they provide legal mechanisms that could be used immediately to promote connectivity and adaptation around and between NRS protected areas.

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[82] *Heritage Rivers Act 1992* (Vic) ss 5, 6, Sch 1, 2.
[83] *Heritage Rivers Act 1992* (Vic) ss 8(1), 10, 12, Schs 3-5, also prohibiting additional water extraction, mining, forestry and stock grazing, and imposing management planning obligations.
[84] *Heritage Rivers Act 1992* (Vic) s 14, Sch 1.
[85] *DPP v Brown* (1998) 100 LGERA 181.
[86] Typically as IUCN category V protected areas, CAPAD 2016, above n 20, 'Victoria' summary; Victorian Environmental Assessment Council, *Statewide assessment of public land: final report* (2017) 2, 17.
[87] Eg NSW Office of Environment and Heritage, *National recovery plan for the Southern Corroboree Frog,* Pseudophryne corroboree, *and the Northern Corroboree Frog* Pseudophryne pengilleyi (NSW Government and adopted by the Australian Department of the Environment, 2012) recommends buffer zones and 'no-go zones' for forestry operations adjacent to both frog species' alpine habitats; Australian Conservation Foundation, Birdlife Australia and Environmental Justice Australia, *Recovery planning: restoring life to our threatened species* (2015) 11.
[88] Eg Parks Victoria, *Port Campbell National Park & Bay of Islands Coastal Park management plan* (1998) cl 8.2.2, '[o]pportunities that arise to acquire land of strategic importance to the Parks should be taken', especially for establishing native vegetation buffers alongside sections of the Parks' inland boundaries.
[89] Eg *Weed Management Act 1999* (Tas) s 31(1), the Minister may declare an area for special weed management attention, and could do so for habitat adjoining protected areas to improve their management in support of climate adaptation goals.
[90] Eg *West Victoria Regional Forest Agreement* (An agreement between the Commonwealth of Australia and the State of Victoria, 2000) 28; Victorian Department of Environment and Primary Industries, *Code of Practice for Timber Production* (2014) 11, defining a 'buffer (strip)' as 'a protective margin of vegetation excluded from any harvesting activity abutting a waterway or an area of rainforest or other special area, which protects it from potentially detrimental disturbances in the surrounding forest'.
[91] Capon, Samantha J et al, 'Riparian ecosystems in the 21st century: hotspots for climate change adaptation?' (2013) 16(3) *Ecosystems* 359.

In the absence of explicit law for connectivity in most Australian jurisdictions, a range of other legal mechanisms have been employed to reduce the harmful effects of fragmentation. For example, multiple continental-scale conservation networks have been developed across tenures, jurisdictional boundaries, and landscapes in Australia, such as the Great Eastern Ranges initiative and Gondwana Link.[92] While private land comprises less than 6% of the NRS,[93] a great deal more private land is managed for conservation informally, contributing to achieving connectivity outcomes in practical ways. For example, voluntary private land initiatives such as the Tasmanian and Victorian government 'Land for Wildlife' programs support landholders to manage informal wildlife corridors and 'stepping stones', with these schemes covering nearly 58,000ha in Tasmania and 530,000ha in Victoria.[94] Non-NRS conservation mechanisms also include government and NGO stewardship arrangements; wildlife refuges; and short-term or less secure covenanting arrangements.[95] Financial incentives and government tax concessions are also critical tools for promoting connectivity for climate adaptation, particularly given the limited capacity for direct regulation to impose 'active management' obligations on landholders.[96]

A range of national and state conservation policies include explicit connectivity goals. For example, the 2012 *National Wildlife Corridors Plan* was intended to prioritise government investment by declaring national wildlife corridors, before it was shelved in late-2013.[97] *Australia's Biodiversity Conservation Strategy 2010-2030* also sets targets to improve ecological connectivity by restoring 1,000km^2 of terrestrial and aquatic landscapes and

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[92] Fitzsimons et al, above n 78; Worboys, Francis and Lockwood, above n 78.
[93] CAPAD 2016, above n 20.
[94] DPIPWE, 'Land for Wildlife' <http://dpipwe.tas.gov.au/conservation/conservation-on-private-land/private-land-conservation-program/land-for-wildlife>; Victorian Department of Environment, Land, Water and Planning, 'Land for Wildlife' <https://www.wildlife.vic.gov.au/land-for-wildlife>.
[95] Booth and Romero, above n 41, 33.
[96] Lausche, Barbara et al, *The legal aspects of connectivity conservation: a concept paper* (IUCN, 2013) [644], [667]-[672]; Australian Department of the Environment and Energy, 'Conservation covenants' <http://www.environment.gov.au/biodiversity/incentives/covenants-tax.html>; Smith, Fiona et al, 'Reforms required to the Australian tax system to improve biodiversity conservation on private land' (2016) 33 *Environmental and Planning Law Journal* 443.
[97] Department of Sustainability, Environment, Water, Population and Communities, Commonwealth Government, *National Wildlife Corridors Plan: a framework for landscape-scale conservation* (2012) 35 <http://155.187.2.69/biodiversity/wildlife-corridors/publications/pubs/national-wildlife-corridors-plan.pdf>, the Environment Minister could declare 'National Wildlife Corridors' subject to agreement with landholders, to prioritise access to federal government funding but no corridor was ever declared.

establishing ‘continental-scale linkages’,[98] although the 2015 ‘interim targets’ were not met, and progress has proven difficult to measure.[99] At the state level, South Australia’s *No Species Loss 2007-2017* strategy establishes a *NatureLinks* Strategic Plan. This plan identifies five priority corridor areas for government-led cooperation in habitat restoration, private and public conservation, and biodiversity monitoring and research.[100]

Climate change will increase the need for holistic approaches to expanding the protected area estate – acknowledging a role for both on and off-reserve conservation activities. This section demonstrated that the patchwork of existing connectivity mechanisms in law and policy does provide *some* support for improving connectivity alongside NRS expansion. However, improvements are needed to tackle landscape fragmentation and facilitate buffer zone and corridor conservation between NRS protected areas.[101]

5.3 Limitations of existing law and policy for climate adaptation

Despite more than two decades of investment in the CAR and JANIS criteria,[102] Australia’s targets for bioregional representation have not been achieved and biodiversity continues to decline at a dramatic rate.[103] This section identifies key legal and policy challenges for achieving an adaptation-oriented, comprehensive, adequate and representative system of protected areas.

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[98] Biodiversity Conservation Strategy, above n 18, 10.
[99] Department of the Environment and Energy, Commonwealth Government, *Report on the review of the first five years of Australia’s Biodiversity Conservation Strategy 2010-2030* (A report by the Biodiversity Working Group, 2016) 55-6.
[100] While not legally enforceable the plan prioritises state, private and NGO investment in state-designated ecological corridors, South Australian Department of the Environment, Water and Natural Resources, ‘No species loss’ <http://www.naturelinks.sa.gov.au>; Government of South Australia, *About NatureLinks: factsheet* (nd).
[101] Steffen et al, above n 12, 156.
[102] And its recent rapid expansion: the NRS covered 13.43% of the continent in CAPAD 2010 *cf* 19.63% coverage in CAPAD 2016, Australian Department of the Environment and Energy, *CAPAD: protected area data* <www.environment.gov.au/land/nrs/science/capad>.
[103] Taylor, above n 53; Cresswell ID and HT Murphy, *Australia State of the Environment 2016: Biodiversity* (Independent report to the Minister for the Environment and Energy, Commonwealth Government, 2017) <https://soe.environment.gov.au/theme/biodiversity> (‘SotE 2016’).

5.3.1 Failure to anticipate and respond to the challenges of climate change

NRS 'comprehensiveness' and 'representativeness' is typically measured against historical baselines. For example, the JANIS criteria propose protection of 'at least 15% of the *pre-1750* distribution of each forest ecosystem'.[104] Legal frameworks for expanding the NRS also tend to be based on a presumption that biodiversity within a protected area will remain relatively stable over time.[105] Climate change will trigger species redistributions and extinctions, and transform ecosystems to such an extent that Australia could have 'environments that are more ecologically different from current conditions than they are similar' by 2070.[106] As discussed in Chapter 4, continuing to focus on historical ecological baselines may undermine biodiversity adaptation efforts. The absence of any acknowledgement of climate change in protected area laws is also a particular concern. Setting aside the failure to specifically refer to climate change, the remainder of this section focuses on two broader limitations in Australia's legal frameworks for protected areas: the problem of spatially- and temporally-fixed boundaries; and the limited legal significance given to the broader landscape context of both prospective and existing protected areas.

(a) Spatially- and temporally-constrained boundaries are insufficiently responsive to change

Protected areas are defined as areas that are conserved 'in perpetuity'.[107] In keeping with that definition, when a new protected area is established, its 'permanent' spatial boundaries are described in detail in the Government Gazette or in a Schedule to an Act.[108] There is, however, a disjunct between this definition of protected areas and the way that it is implemented in law. Legal mechanisms for changing protected area boundaries do exist,

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[104] JANIS criteria 1997, above n 27, italics added.
[105] Paradigm 1, Chapter 4, Section 4.2.3.
[106] Dunlop, Michael et al, *Implications for policymakers: climate change, biodiversity conservation and the National Reserve System* (CSIRO Climate Adaptation Flagship, 2012) 4-5.
[107] Internationally, Dudley, above n 18; in Australia, NRS Guidelines, above n 18.
[108] Proclamation or declaration in the Government gazette, eg *Nature Conservation Act 2002* (Tas) ss 11-13; for boundaries recorded in a statutory schedule, see *National Parks Act 1975* (Vic) Schs 2-4; note: private protected area boundaries are recorded in spatially specific terms, in a conservation covenant registered on a property title.

including provisions that allow governments to revoke and re-gazette a protected area with new boundaries or amend a Schedule in which a protected area's boundaries are defined;[109] though they are typically used to facilitate development or land access rather than for conserving dynamic biodiversity. Current conservation efforts presume that biodiversity in a protected area can be contained within its boundaries and protected there, in perpetuity.[110] As climate change triggers changes to species distributions and ecosystems, over time, the values for which a protected area was established may cease to exist within the legally defined boundaries of the area.

For example, coastal wetlands in protected areas – such as the 'Pitt Water - Orielton Lagoon Ramsar Site' located in the Pitt Water Nature Reserve in Tasmania[111] – are vulnerable to changing weather conditions and sea level rise.[112] In some cases, wetland ecosystems may adapt by retreating landwards, in other cases, coastal biodiversity may contract in distribution or be lost entirely.[113] The Ramsar Convention, as it is implemented in Australia, requires explicit and detailed boundary descriptions to recognise an area as an internationally significant wetland.[114] Ramsar wetlands *Boundary Description and Mapping Guidelines* provide that 'the description should enable the boundaries of the Ramsar site to be objectively ascertained… [and] should be unambiguous and clearly define the extent of the site...'.[115] There is no mechanism for a retreating wetland to retain its 'internationally significant' legal status outside of those defined boundaries. National guidance on notifying changes in the ecological character of Australia's Ramsar Wetlands explicitly excludes notifying the Convention Secretariat of changes to the ecological

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[109] Section 5.3.4, below.
[110] Dudley, above n 18; Rogers, Kerrylee, Neil Saintilan and Craig Copeland, 'Managed retreat of saline coastal wetlands: challenges and opportunities identified from the Hunter River Estuary, Australia' (2013) 37(1) *Estuaries and Coasts* 67, 75.
[111] Australian Department of the Environment and Energy, 'Ecological character description' <http://www.environment.gov.au/water/wetlands/publications/pitt-water-orielton-lagoon-ramsar-site-ecological-character-description>.
[112] Among many other effects of climate change, see Capon, S, *Climate change impacts on coastal freshwater ecosystems and biodiversity: CoastAdapt Impact Sheet 4* (National Climate Change Adaptation Research Facility, 2016).
[113] Ibid; Rogers et al, above n 110.
[114] Australian Department of the Environment and Energy, *Australian national guidelines for Ramsar wetlands* <http://www.environment.gov.au/water/wetlands/ramsar/australian-national-guidelines>.
[115] Australian Department of the Environment and Energy, *Boundary description and mapping guidelines* (2nd ed, 2014) 8, 19 <http://www.environment.gov.au/water/wetlands/publications/boundary-description-and-mapping-guidelines-second-edition>.

character of a wetland where the principal cause is climate change.[116] The perverse effect of this approach is that 'internationally significant' wetlands adapting to rising sea levels by retreating will progressively lose their protected status to the extent that they are located outside the site's formal, mapped boundaries.[117]

Similarly, climate projections for the Tasmanian Midlands region indicate likely contractions and southward-shifts in the distribution of the Commonwealth-listed, critically endangered Tasmanian Lowland Temperate Native Grasslands ecological community, and the Tasmanian-listed threatened species, the *Ptunnara brown butterfly*. Both are distributed predominantly on private land and have potential future distributions occurring wholly outside of the boundaries of the private reserves established to conserve them.[118] Both will continue to benefit from legal mechanisms for reducing the effect of 'threatening processes' on listed species and communities as their distributions change;[119] and covenanting mechanisms for private land. However, even if covenanting provisions provide for flexible, adaptation-oriented management, conservation covenants themselves relate to spatially-fixed areas, and bind landholders to management activities whether or not the biodiversity they are managing for continues to occur on their land.[120]

(b) Insufficient significance given to adjacent land uses

The second limitation for achieving more 'climate responsive' protected area laws, is the limited legal significance given to land uses adjacent to proposed new protected areas and between proposed areas and existing protected areas in the broader network. Many

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116 Australian Department of the Environment and Energy, *National guidelines for notifying change in ecological character of Australian Ramsar sites: Article 3.2* ('Module 3' of the National Guidelines for Ramsar Wetlands, 2009) 3.
117 Rogers et al, above n 110, 76; options for expanding protected areas in coastal areas have been considered in Runting, RK et al, 'Costs and opportunities for preserving coastal wetlands under sea level rise' (2017) 10(1) *Conservation Letters* 49, 53 in which the authors find carbon payments could reduce purchase costs by up to 60% under low sea-level-rise scenarios.
118 Harris, RMB et al, 'Noah's Ark conservation will not preserve threatened ecological communities under climate change' (2015) 10(4) *PLOS One* e0124014; McDonald, J et al, 'Rethinking legal objectives for climate-adaptive conservation' (2016) 21(2) *Ecology and Society* 25.
119 Including EPBC Act assessment of any project that is likely to cause significant harm to the grasslands as a matter of national environmental significance, and for the butterfly, threat abatement and recovery planning under the provisions of *Threatened Species Protection Act 1995* (Tas).
120 Interview #10 (NGO), suggesting that the most important challenge lies, 'with the stationary nature of the boundaries, and questions about the ease with which they can (or should) be varied where the agreement no longer represents best practice, or the reality of the ecological and other values present on the covenanted land'; Harris et al, above n 118.

protected areas, particularly in Australia's agricultural regions, are small and isolated.[121] Despite large-scale connectivity initiatives reducing the distance, on average, between protected areas over the past decade, land use intensification between protected areas has been blamed for a reduction in overall functional connectivity.[122]

Without direct legal support for connectivity initiatives, there are few incentives to rapidly develop coordinated, high-level conservation management across jurisdictional boundaries, tenures and land uses – a crucial development for ensuring that connectivity strategies effectively promote biodiversity adaptation.[123] Indeed, perverse incentives to do the opposite must be removed, including incentives to increase fragmentation arising from deregulating native vegetation clearing;[124] agricultural subsidies for land clearing and development;[125] and in biodiversity offset schemes that enable clearing in remnant, climate-critical, or high-conservation value ecosystems.[126]

Recent research has identified that land uses immediately adjacent to a protected area are *as significant* for conserving biodiversity in that area as conservation management within its boundaries.[127] In combination with expanding scholarship on the importance of connectivity for climate adaptation, that research suggests that [protection of] landscapes adjacent to and between NRS protected areas must become a critical priority for protected area laws to facilitate adaptation under climate change.

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121 SotE 2016, above n 103; Dudley, Nigel et al, 'Where now for protected areas? Setting the stage for the 2014 World Parks Congress' (2014) 48(04) *Oryx* 496, 499; interview #15 (research).
122 Taylor et al, above n 28, 4.
123 Wyborn, Carina, 'Cross-scale linkages in connectivity conservation: adaptive governance challenges in spatially distributed networks' (2015) 25(1) *Environmental Policy and Governance* 1; Lausche, above n 96, [659].
124 See Chapter 7.
125 Including emergency relief funding and construction of irrigation infrastructure, McCormack and McDonald, above n 23, 127; Lausche, above n 96, [663]; Griffith, G, 'Right to farm laws' (E-brief 5/2015, NSW Parliamentary Research Service, 2015).
126 McDonald, Jan, Phillipa C McCormack and Anita Foerster, 'Promoting resilience to climate change in Australian conservation law: the case of biodiversity offsets' (2016) 39(4) *UNSW Law Journal* 1612; Environmental Defender's Office NSW ('EDO NSW'), *Climate change and the legal framework for biodiversity protection in Australia: a legal and scientific analysis discussion paper* (2009).
127 Eg Laurance, et al, above n 66; Cory R Davis and Andrew J Hansen, 'Trajectories in land use change around U.S. National Parks and challenges and opportunities for management' (2011) 21(8) *Ecological Applications* 3299.

5.3.2 Inadequate 'completion' of the NRS

Australia has exceeded its area-based target of 17% of the continent, which is one of the international 'Aichi Biodiversity Targets' set in 2011 under the CBD's *Strategic Plan for Biodiversity*.[128] However, the expansion of the NRS has been uneven, with areas of economic activity and potential far less likely to have 17% of their remaining biodiversity reserved in the NRS, undermining the achievement of a comprehensive, adequate and representative system of protected areas.[129] While representation of biodiversity has generally gradually improved,[130] many ecological communities and habitat for critically endangered species are still located wholly outside of the NRS.[131] For other communities and ecosystems, the extent of historical clearing and conversion means that targets cannot be achieved without conserving all remaining examples as well as investing heavily in ecological restoration.[132] It is difficult to assess whether the adequacy target is being met, as measures are opaque and the target itself continues to be poorly understood.[133]

Gaps in achieving existing NRS priorities have 'serious ramifications' for facilitating adaptation and reducing vulnerability to climate change;[134] and their achievement may become more challenging as the climate continues to change.[135] Nevertheless, the CAR criteria continue to be supported as an appropriate way to direct adaptation-oriented

[128] CBD and Aichi Biodiversity Targets, above n 16; CAPAD 2016, above n 20; but see Barnes, Megan, 'Protect biodiversity, not just area' (2015) 526 *Nature* 195.
[129] Taylor, Fitzsimons and Sattler, above n 28, 14; although there has been significant progress over the past decade, with just seven bioregions 'poorly protected' in 2012, down from 17 in 2002, at 3; Ritchie, Euan G et al, 'Continental-scale governance and the hastening of loss of Australia's biodiversity' (2013) 27(6) *Conservation Biology* 1133, 1134.
[130] Taylor, above n 53, 5-6, describing improvements in area representation for terrestrial targets under Aichi Target 11.
[131] Ibid, 7-10; few critically endangered species reach the minimum standard of habitat protection (29%) and many critically endangered species have none of their habitat protected (20%), although 'the distributions of these species tend to be small and localised', Taylor, Fitzsimons and Sattler, above n 28, 14, 62; Watson JEM et al, 2011 'The capacity of Australia's protected area system to represent threatened species', *Conservation Biology* 25, 324–332.
[132] Taylor, Fitzsimons and Sattler, above n 28, 62, 65.
[133] Ibid 65; interviews, #14 (government), #32 (research), #38 (research) *cf* #7 (government).
[134] Watson, JE et al, 'The performance and potential of protected areas' (2014) 515(7525) *Nature* 67, 69.
[135] Including, eg because of human responses to climate change and changing land uses, McGeoch, Melodie A, Terence P Dawson and Lindsey Gillson, 'Accommodating the human response for realistic adaptation planning: repsonse to Watson and Segan' (2013) 28(10) *Trends in Ecology & Evolution* 574; interviews #1 (government), *cf* #10 (NGO), #11 (advocate), #18 (research), arguing that the CAR criteria *ought* to be achievable in Australia despite climate ongoing change, and having committed to deliver on those criteria, including at the international scale under the CBD and Aichi Biodiversity Targets, national and state governments ought to be doing more to ensure that they are achieved.

expansion.[136] Indeed, the NRS is considered a 'highly robust conservation strategy in the face of climate change'.[137] Meeting bioregional representation targets under current conditions is expected to continue to provide a representative NRS in future – though perhaps of an entirely different suite of ecological components under significantly changed climatic conditions.[138]

A major challenge for improving bioregional representation is that it will be virtually impossible to achieve on public land. Many species populations and ecological communities located outside the NRS are distributed primarily or solely on private land,[139] and a large proportion of the Australian continent is privately owned or managed. For example, agricultural land on its own accounts for approximately 60% of the Australian landmass,[140] which includes vast pastoral leaseholds across regional Australia. Pastoral leases are statutory interests granted over Crown land that statutorily limit land use to stock grazing and ancillary purposes; constraining the expansion of the NRS in those areas.[141] However, Australia is a world leader in establishing private protected areas, with well-established legal frameworks enabling conservation covenanting and integrating private protected areas into the broader NRS.[142] Private protected areas are typically smaller and more fragmented than public protected areas, but their role in landscape-scale conservation is likely to become increasingly critical as the climate changes.[143]

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[136] Albeit with a shift towards climate-ready priorities for each criterion, Dunlop et al, above n 6, 58; all but one of the 40 participants in this research supported retaining the CAR criteria, at least as a guide, for expanding the NRS.

[137] Dunlop, M and PR Brown, *Implications of climate change for Australia's National Reserve System* (A preliminary assessment report to the Commonwealth Department of Climate Change, 2008) found that the bioregional approach to developing the NRS, and particularly the 'comprehensive' and 'representative' criteria, is well-suited to ensuring a protected area system that is highly robust under climate change, *when implemented*, 126, 173.

[138] Dunlop et al, above n 6, 48-51, 58.

[139] SotE 2016, above n 103; Taylor, Fitzsimons and Sattler, above n 28, 14.

[140] Australian Bureau of Statistics, '1301.1: Land Tenure' in *Year Book Australia, 2002* (ABS, 2002).

[141] Eg *Land Administration Act 1997* (WA) s 106(1) provides that a lessee must not use pastoral lease land for purposes other than pastoral purposes, with a penalty of $10,000 for breach; the *Pastoral Land Act 1992* (NT) s 31 provides that pastoral leases must be for pastoral purposes, and s 48 allows leases to be granted in perpetuity; see also *Pastoral Land Management and Conservation Act 1989* (SA), and the *Land Act 1994* (Qld) s 472 defines pastoral leases as 'term leases for a pastoral purpose'.

[142] Bingham, Heather et al, 'Privately protected areas: advances and challenges in guidance, policy and documentation' (2017) 23(1) *PARKS* 13, 16; Fitzsimons, James A, 'Private protected areas in Australia: current status and future directions' (2015) 10 *Nature Conservation* 1.

[143] Comprising only 7% of the NRS as a whole, CAPAD 2016, above n 20; Fitzsimons, James A and Geoff Wescott, 'Ecosystem conservation in multi-tenure reserve networks: the contribution of land outside of

5.3.3 Limitations in the implementation of legal processes

Limited funding for legal processes to expand the NRS is a crucial, and ongoing, challenge for meeting legal obligations and policy undertakings in this area.[144] Commonwealth funding had supported expansion of the NRS until it was withdrawn in 2012.[145] Similar state funding cuts have seen successful covenanting programs shelved or suspended, such as the Tasmanian Protected Areas on Private Land program.[146] Victoria's Trust for Nature was praised by one non-government stakeholder interviewed for this research for pursuing its crucial conservation and adaptation priorities on private land in Victoria in a remarkably effective and efficient way, despite having a 'pitifully small' budget.[147] Greater funding commitments for expanding the NRS, and particularly for increasing the private protected area estate, will be essential for meeting bioregional 'representative' criteria as an adaptation response to climate change.

Existing criminal sentencing and civil enforcement processes may also undermine adaptation by balancing the significance of offending in protected areas in favour of stationary rather than dynamic conceptions of nature. For example, in *Minister for the Environment and Heritage v Greentree (No. 3),* Sackville J held that the degraded status of a Ramsar wetland was a mitigating factor in assessing the significance of its intentional

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publicly protected areas' (2008) 14 *Pacific Conservation Biology* 250; Fitzsimons, JA and Wescott G, 'The role of multi-tenure reserve networks in improving reserve design and connectivity' (2008) 85(3–4) *Landscape and Urban Planning* 163; *cf* Adams, V and K Moon, 'Security and equity of conservation covenants: contradictions of private protected area policies in Australia' (2013) 30 *Land Use and Policy* 114-119; interviews #10 (NGO), #15 (research).

[144] Taylor, above n 53, 3, 15; Young, MD et al, *Reimbursing the future: an evaluation of motivational, voluntary, price-based, property-right, and regulatory incentives for the conservation of biodiversity* (1996) 145.

[145] Taylor, above n 53, 15; despite recommendations to 'significantly increase the funding allocation directed to the NRS Programme' due to its 'extremely successful' and efficient role in NRS expansion, Senate Committee on the Environment, Communications, Information Technology and the Arts ('ECITA'), Parliament of Australia, *Conserving Australia: Australia's national parks, conservation reserves and marine protected areas* (2007) vii.

[146] A private/public collaboration that established 260 covenants (covering >22,000 hectares) but which is 'not accepting new applications', DPIPWE, 'Protected Areas on Private Land program' <http://dpipwe.tas.gov.au/conservation/conservation-on-private-land/private-land-conservation-program>; the Tasmanian Private Forests Reserve Program (1997-2006), Forest Conservation Fund (2006-2009) and Non-Forest Vegetation Project (2003-2010) have also been discontinued.

[147] Interview #15; the Trust registered 34 new conservation covenants in 2016-7 and actively managed more than 50,000 hectares of land with less than $3.4 million in government and operating grants – with government grants declining every year for the past 5 years, Trust for Nature, *Annual report 2016-17* (2017) 11, 23.

destruction.[148] Where the 'pristine' nature of some, and perhaps many, protected areas will be transformed as the climate changes, harm to a protected area may need to rely on measures other than historical ecological baselines. Destroying natural values in already degraded protected area may need to be re-defined as an aggravating rather than a mitigating circumstance in sentencing or civil liability, on the basis that it decreases biodiversity's adaptive capacity as the climate changes.

5.3.4 Risks of eroding the NRS through PADDD

There is growing evidence of 'widespread' defunding, downgrading, downsizing, and de-gazettement of protected areas around the world, a process known as 'PADDD'.[149] *Downgrading* a protected area is defined as providing legal authorisation for increased human activity within its boundaries;[150] *downsizing* involves changes to the legal boundary of a protected area to reduce its overall size; and *de-gazettement* is the removal of legal protection for a whole protected area, for example, by revoking a protected area declaration.[151] A recent Australian study identified that alongside large increases in the NRS, there have been 1,500 instances of PADDD between 1997-2014, particularly in the form of reductions in the size or level of protection for individual protected areas.[152]

Recent evidence of PADDD processes in practice demonstrate trade-offs between conservation and other policy objectives, especially access to and use of natural resources

[148] *Minister for the Environment and Heritage v Greentree (No. 3)* (2004) LGERA 136, per Sackville J; *cf* [non-NRS case] *Director-General, Department of Environment and Climate Change v Walker Corporation Pty Ltd (No 4)* [2011] NSWLEC 119, where the fact of earlier disturbance was *not* used to reduce the accused's penalty for causing environmental damage, at [90], upheld on appeal in *Walker Corp Pty Ltd v Director-General* (2012) 82 NSWLR 12.
[149] Mascia M and S Pailler 'Protected area downgrading, downsizing, and degazettement (PADDD) and its conservation implications' (2011) 4 *Conservation Letters* 9; Watson et al, above n 134, 67; Symes WS et al, 'Why do we lose protected areas? Factors influencing protected area downgrading, downsizing and degazettement in the tropics and subtropics' (2016) 22(2) *Global Change Biology* 656.
[150] Eg recent proposed changes to the status of national parks in Australia include allowing grazing, recreational hunting and shooting, and proposed tourism developments, Watson et al, above n 134, 70; Ritchie et al, above n 129.
[151] Watson et al, above n 134.
[152] Cook, CN et al, 'Quantifying the extent of protected-area downgrading, downsizing, and degazettement in Australia' (2017) 31 *Conservation Biology* 1039, 1039; World Wide Fund for Nature ('WWF'), 'PADDDtracker: Australian country profile' (2017) <www.padddtracker.org/>.

in protected areas.[153] Increased exposure to PADDD-related non-climatic stressors – such as fragmentation by roads and resource extraction[154] – will reduce the adaptive capacity of biodiversity in and around protected areas, and magnify the effect of climate-related stressors as they arise.[155] As climate change affects the ecological health and adaptive capacity of biodiversity conserved within existing protected areas, PADDD pressures may also offset or undermine increased efforts to rapidly expand and enhance the NRS for biodiversity conservation and adaptation.[156]

PADDD processes have been promoted by some as a ‘protective’ or efficiency tool, allowing less valuable land to be swapped for more valuable land, and reducing acquisition and management costs in the process. However, even in this ‘protective’ form, PADDD removes areas managed primarily for conservation from the protected area estate. Labelling protected areas ‘redundant’ when they are no longer home to the species that were distributed within them at the time that they were declared[157] fails to acknowledge the certainty of climate-driven species’ redistribution[158] and the need to develop and manage large-scale, connected areas to enhance the adaptive capacity of biodiversity across whole landscapes. PADDD is problematic in the context of the adaptation imperative to maximise conserved land – by area, representativeness and redundancy[159] – to avoid system-wide transformation or collapse. PADDD also has serious implications for broader protected area values, including indigenous and cultural, spiritual, recreational, aesthetic and

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[153] Eg the *Nature Conservation Act* (Qld) was amended in 2013 to add social, cultural and commercial objects alongside conservation objects for national parks – downgrading the protective status of all established national parks – though the changes were reversed in May 2016, Ritchie et al, above n 129, 1134.
[154] Mascia and Pailler, above n 149, 17; Symes et al, above n 149.
[155] Interview #32 (research); Laurance et al, above n 66; Prugh L et al, ‘Effect of habitat area and isolation on fragmented animal populations’ (2008) 105 *Proceedings of the National Academy of Science USA* 20770.
[156] Ritchie et al, above n 129.
[157] Alagador, Diogo, Jorge Orestes Cerdeira and Miguel Bastos Araújo, ‘Shifting protected areas: scheduling spatial priorities under climate change’ (2014) 51(3) *Journal of Applied Ecology* 703, 704.
[158] Eg Pecl, Gretta T et al, ‘Biodiversity redistribution under climate change: impacts on ecosystems and human well-being’ (2017) 355(6332) *Science* eaai9214-1; Bonebrake et al, above n 10.
[159] NRS Guidelines, above n 18; Taylor M and P Figgis (eds) ‘Protected areas: buffering nature against climate change’ (Proceedings of a WWF and IUCN World Commission on protected areas symposium, 18-19 June 2007, WWF-Australia) 4, noting that ‘[r]eplication is a central element in determining the Adequacy of the reserve system’.

educational values, all of which may be affected or lost if a protected area is reduced in size, or its status is downgraded or revoked.[160]

Until recently, PADDD was '…a largely unrecognized threat to biodiversity',[161] but it is increasing in all of its forms, including in Australia.[162] Protected area legislation generally requires a declaration of revocation to be approved by both houses of Parliament,[163] but little-to-no legal guidance is provided about the level of consultation required before a protected area can be downgraded or revoked, or any scientific or other considerations that should be taken into account.[164] Recommendations for adaptation-oriented reform on the issue of PADDD are set out in Section 5.4.3.

5.4 Recommendations: new approaches and mechanisms for an adaptation-oriented legal framework for the NRS

Explicitly referring to climate change projections when identifying and establishing new protected areas is a crucial reform that will improve the capacity of the NRS to accommodate future change.[165] This is already taking place in some jurisdictions.[166] Additional and complementary approaches will also be required to improve proactive and adaptive approaches to expanding the NRS and enhance flexibility without reducing decision makers' accountability. This section begins with recommendations to address the

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160 Chape, S et al, *The world's protected areas: status, values and prospects in the 21st Century* (UNEP-WCMC, 2008); Alagador et al, above n 157, 711.
161 Mascia and Pailler, above n 149, 11.
162 Eg Watson et al, above n 134; WWF PADDDtracker, above n 152.
163 Eg *Nature Conservation Act* (Tas) s 21(1), (4); EPBC Act s 350; *cf Legislation Act* (ACT) s 46 which provides that the 'power to make a declaration includes the power to amend or repeal the declaration. The power to amend or repeal the declaration is exercisable in the same way, and subject to the same conditions, as the power to make the declaration'.
164 Eg EPBC Act s 351 requires a comprehensive report prior to proclaiming a reserve, including an invitation for public comment, but for revocation, simply publication of a notice identifying the boundaries of the relevant Commonwealth reserve.
165 Groves, Craig R et al, 'Incorporating climate change into systematic conservation planning' (2012) 21(7) *Biodiversity and Conservation* 1651; eg by increasing the representation of current species and ecosystems *and* reserving likely future habitats, Hannah et al, above n 41, 135, 136; Dunlop, Michael et al, *Climate-ready conservation objectives: a scoping study* (National Climate Change Adaptation Research Facility, 2013) 23.
166 Eg 'heat mapping' is being used to prioritise new protected areas to promote climate adaptation through the 'NatureAssist' program, Queensland Department of Environment and Heritage Protection, 'Nature refuges' (2017) <www.ehp.qld.gov.au/ecosystems/nature-refuges/>; Hill, R et al, 'Why biodiversity declines as protected areas increase: the effect of the power of governance regimes on sustainable landscapes' (2015) 10(2) *Sustain Sci* 357.

limitations in existing law for implementing the connectivity adaptation strategy. The section then applies each of the three legal design principles from Chapter 4, in turn, to propose legal reforms for implementing the protected area strategy in *expanding* the NRS.[167]

5.4.1 Promote appropriate landscape-scale connectivity

Despite the limited number of examples around the world of practical, integrated on- and off-reserve planning, the effects of climate change will render such approaches 'increasingly vital under climate change'.[168] In response, this section proposes greater reliance on systematic conservation planning that accommodates projected climate impacts,[169] and explicit legal and policy mechanisms for restoring or creating landscape connectivity around and between formal protected areas.[170]

(a) Systematic conservation planning

Systematic conservation planning is a tool for strategically designing and implementing reserve networks – and complementary activities off-reserve – to optimise conservation investment and achieve long-term conservation goals.[171] The concept is not a new one,[172] but systematic conservation planning is increasingly seen as critical for adaptation-oriented reserve network design, and for reducing uncertainty in conservation decision making under climate change.[173] Key benefits include efficiency in applying limited conservation resources;[174] 'defensibility and flexibility' for NRS decisions about expansion in the face

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[167] For second component of the protected area adaptation strategy, *enhancing* the NRS, see Chapter 6.
[168] Bonebrake et al, above n 10; Steffen et al, above n 12, 166-9.
[169] Groves et al, above n 165.
[170] Mora, C and PF Sale, 'Ongoing global biodiversity loss and the need to move beyond protected areas: a review of the technical and practical shortcomings of protected areas on land and sea' (2011) 434 *Mar. Ecol. Prog. Ser*. 251.
[171] Margules CR and RL Pressey, 'Systematic conservation planning' (2000) 405 *Nature*: 243-253; Alagador et al, above n 157, 703; Grantham, Hedley S, 'Effective conservation planning requires learning and adaptation' (2009) 8(8) *Frontiers in Ecology and the Environment* 431.
[172] Ibid; Sarkar, Sahotra et al, 'Biodiversity conservation planning tools: present status and challenges for the future' (2006) 31(1) *Annual Review of Environment and Resources* 123.
[173] Eg Carvalho, Sílvia B et al, 'Conservation planning under climate change: toward accounting for uncertainty in predicted species distributions to increase confidence in conservation investments in space and time' (2011) 144(7) *Biological Conservation* 2020; Groves et al, above n 165.
[174] Eg Shoo, Luke P et al, 'Making decisions to conserve species under climate change' (2013) 119(2) *Climatic Change* 239; McDonald, Jane A et al, 'Improving policy efficiency and effectiveness to save more species: a case study of the megadiverse country Australia' (2015) 182 *Biological Conservation* 102.

of competing land uses; and enhanced accountability through critical review of explicit priorities.[175] Systematic approaches also provide an explicit decision-making framework to balance the relative importance of acquiring protected areas for connectivity or isolation,[176] across all land tenures.[177] Importantly for biodiversity adaptation, systematic planning can incorporate ‘engineered’ and restored habitats into reserve network planning. For example, systematic approaches may prioritise conservation of constructed or restored ‘microclimate and microhabitat refuges’ in degraded ecosystems, where remnant habitat has been lost or is particularly vulnerable to climate threats.[178] Similarly, systematic planning could progressively identify *emerging* climate refugia – and migration pathways to them – across the NRS.[179] However, systematic conservation planning will not improve the inclusion of these areas in the NRS unless statutory protected area categories are also defined with sufficiently flexibility to accommodate future and novel biodiversity values.[180]

Systematic conservation planning is predicated on the existence of clearly articulated legal and policy goals.[181] As discussed in Chapter 4, the goals and purposes expressed in Australian conservation laws are often unclear, contradictory and/or ill-suited to facilitate biodiversity adaptation. The reforms recommended in that chapter will contribute to improving systematic conservation planning for connectivity.[182] Other challenges for implementing systematic conservation planning include the difficulty of balancing scientific criteria for optimising conservation outcomes with social, political and economic imperatives.[183] Systematic conservation planning also requires detailed information about landscape and biodiversity features, which can be expensive and time consuming to

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[175] Margules and Pressey, above n 171.
[176] Hermoso V, SR Januchowski-Hartley and S Linke, ‘Systematic planning of disconnection to enhance conservation success in a modified world’ (2015) 536 *Sci Total Environ* 1038.
[177] Dunlop et al, above n 6, 8; Opdam, Paul and Dirk Wascher, ‘Climate change meets habitat fragmentation: linking landscape and biogeographical scale levels in research and conservation’ (2004) 117(3) *Biological Conservation* 285; Doerr VAJ et al, *Designing landscapes for biodiversity under climate change* (National Climate Change Adaptation Research Facility, 2013); EDO NSW, above n 126, 66.
[178] Bonebrake et al, above n 10, 30.
[179] Taylor and Figgis, above n 159, 3.
[180] See Section 5.2.2.
[181] Eg Margules and Pressey, above n 171; Segan, Daniel B et al, ‘Can we determine conservation priorities without clear objectives?’ (2010) 143(1) *Biological Conservation* 2, 2; and clear, explicit goals are even more important for adaptation-oriented systematic conservation, Reside, April E, Nathalie Butt and Vanessa M Adams, ‘Adapting systematic conservation planning for climate change’ (2018) 27(1) *Biodiversity and Conservation* 1.
[182] See Chapter 4.
[183] Margules and Pressey, above n 171.

collect, analyse and apply.[184] Despite these challenges, greater reliance on systematic conservation planning will be critical to avoid perverse outcomes in NRS expansion, such as the counter-intuitive finding that expanding the number of protected areas in the NRS has coincided in some cases with increased deforestation and biodiversity loss.[185]

Some state government agencies are already implementing systematic, adaptation-oriented approaches to expanding the NRS.[186] However, the fragmented nature of Australia's federal system means that systematic conservation planning at continental and landscape scales, and across political borders, will likely require greater legal and policy consistency.[187] However, existing examples of collaboration across borders to improve integration in conservation planning could provide broader lessons in this regard, including the multi-agency approach to managing the Alpine National Parks located across the borders of NSW, Victoria and the ACT.[188]

(b) Legal mechanisms for promoting appropriate connectivity

There is an urgent need for legal frameworks to consistently integrate new protected areas with the management of surrounding landscapes and the broader NRS network, including by improving connectivity and conserving buffer zones.[189] To achieve this, explicit legal and policy guidance is needed. The *Nature Conservation Act 2002* (Tas) provision for conserving buffer zones, described in Section 5.2.5, appears never to have been used. A

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[184] But exceptionally useful for conservation decision making, interview #34 (local government), and for modelling the spatial distribution of climate change refugia, Lechner, AM et al, 'A framework for incorporating fine-scale dispersal behaviour into biodiversity conservation planning' (2015) 141 *Landscape and urban planning* 11; Reside, April E et al, *Climate change refugia for terrestrial biodiversity: defining areas that promote species persistence and ecosystem resilience in the face of global climate change* (National Climate Change Adaptation Research Facility, 2013).

[185] Hill et al, above n 166.

[186] Eg NSW Department of Environment, Climate Change and Water, *Planning for catchment biodiversity targets at a local landscape scale: a proposal for the South-west Slopes Bioregion of NSW* (2009) i, 17; and systemic conservation approaches are also being applied at local and regional scales for identifying new reserves and conserving locally significant biodiversity, interviews #36 (local), #34 (local), #28 (regional).

[187] Clement, Sarah, Susan A Moore and Michael Lockwood, 'Authority, responsibility and process in Australian biodiversity policy' (2015) 32 *Environmental and Planning Law Journal* 93.

[188] Clement, Sarah, Susan A Moore and Michael Lockwood, 'Letting the managers manage: analyzing capacity to conserve biodiversity in a cross-border protected area network' (2016) 21(3) *Ecology and Society* 39; Whitten, Stuart et al, *A compendium of existing and planned Australian wildlife corridor projects and initiatives, and case study analysis of operational experience* (A report for the Australian Government Department of Sustainability, Environment, Water, Population and Communities, CSIRO Ecosystem Sciences, 2011).

[189] Worboys, Francis and Lockwood, above n 78, Taylor, Fitzsimons and Sattler, above n 28, 14.

statutory obligation may be necessary to, for example, compel decision makers to consider reserving one or more buffer zones, every time a new protected area is established. Adaptation-oriented objects clauses and other legal purposes in conservation legislation may also improve implementation of such provisions.[190]

Promoting continental-scale connectivity for biodiversity adaptation would also benefit from Commonwealth government direction and funding.[191] However, with the *National Wildlife Corridors Plan* shelved in 2013,[192] and in the absence of any other national policy framework, connectivity conservation can nevertheless be facilitated by supportive state and regional legislation and policy.[193] State and territory governments already collaborate on cross-jurisdictional initiatives such as Gondwana Link[194] and the Great Eastern Ranges connectivity conservation area.[195] Governments can also prioritise key connectivity areas for rehabilitation and conservation funding by brokering conservation activities across different tenures and governance arrangements, and prioritising conservation resources for habitat 'stepping stones' between protected areas or along identified corridors.[196] Trust for Nature in Victoria is already implementing this approach through a strategic plan that prioritises private land acquisition for the NRS along key Victorian biodiversity corridors.[197]

Legal frameworks for land use planning and development assessment can also play a crucial role in promoting adaptation-oriented management at landscape and bioregional scales. Local governments promote conservation-oriented land uses adjacent to and

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[190] Chapter 4, Section 4.2.2(c), (d).
[191] Eg EDO NSW, above n 126, 1-4; Chapter 8, Section 8.4.2.
[192] *National Wildlife Corridors Plan*, above n 97; with no other policy mechanism at the national level for promoting connectivity, evidence to support the NRS being 'well connected in the landscape' for the purposes of the Aichi Targets is difficult to find, Taylor, Fitzsimons and Sattler, above n 28, 4.
[193] Dudley et al, above n 121, 499; Lausche, above n 96, 171; Mansergh I, 'Biolinks' in Fitzsimons JA et al (eds) *Linking Australia's landscapes: lessons and opportunities from large-scale conservation networks* (CSIRO Publishing 2013); Central Victorian Biolinks Alliance, 'About Biolinks Alliance' <https://biolinksalliance.org.au/about-us>.
[194] Gondwana Link is a collaboration between Commonwealth, WA and SA governments, as well as environmental NGOs, individual landholders and community organisations such as local Landcare groups, Gondwana Link, 'The Gondwana Link vision' (2015) <http://www.gondwanalink.org/aboutus/vision.aspx>.
[195] The Great Eastern Ranges, 'About us' <http://www.greateasternranges.org.au>; and in the management of the Alpine national parks, Clement, Moore and Lockwood, above n 188.
[196] Eg South Australia's *NatureLinks*, above n 100.
[197] Robinson D et al, *The Statewide Conservation Plan for Private Land in Victoria* (Trust for Nature, 2013).

between formal protected areas,[198] including by conserving areas of high local biodiversity value that would not qualify for recognition in the NRS under local government agreements with landholders.[199] State and Commonwealth strategic and bioregional planning processes[200] have also been identified as valuable tools for adaptation-oriented land use planning and conservation.

Bioregional planning, in particular, can help to integrate NRS protected areas with surrounding land uses; manage cumulative impacts on biodiversity from development; and facilitate conservation of protected area buffer zones, climate refugia and, if appropriate, habitat corridors.[201] In these respects, bioregional planning has the hallmarks of a statutory expression of systematic conservation planning, and could be used far more effectively to achieve similar goals. Bioregional planning processes can identify 'no-go zones' that must be conserved as well as economic development areas within a bioregion, catchment or local government area.[202]

However, to avoid perverse outcomes from the static designation of either a 'sacrificial' or 'no-go' area – which may preclude flexibility to conserve emerging climate refugia or newly-discovered species populations – the emphasis of an adaptive bioregional plan may need to be on clarifying '*what* our "no go" impacts or losses are, but not necessarily

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[198] Using native vegetation controls and conservation zoning and overlays; interviews #29 (state), #34 (local), #36 (local); Ritchie et al, above n 129.
[199] Conservation covenants can be negotiated with state governments for this purpose; other agreements include: 'Section 173 Agreements', Victorian statutory instruments created under *Planning and Environment Act 1987* (Vic) s 173, which allow a responsible authority, including a local council, to enter into an agreement with an owner of land in the council's planning area; and their Tasmanian equivalent, 'Part 5 Agreements', created under *Land Use Planning and Approvals Act 1993* (Tas) Part 5, which is required in some situations to obtain a planning permit; interviews #32 (research), #34 (government).
[200] EPBC Act Part 10 (strategic planning), Part 12 (bioregional planning); *Catchment and Land Protection Act 1994* (Vic) s 27 (catchment plans).
[201] Taylor and Figgis, above n 159, 1, 9; Australian Panel of Experts on Environmental Law, *Terrestrial biodiversity conservation and natural resources management* (Technical Paper 3, 2017) 25; Hawke, Allan, *The Australian Environment Act: report of the independent review of the Environment Protection and Biodiversity Conservation Act 1999* (Report to the Commonwealth Department of the Environment, Water, Heritage and the Arts, 2009) 78-95; interviews #2 (consultant), #30 (advocate).
[202] APEEL, above n 201; Pope, Jenny and Susan A Moore, *Planning and assessment for biodiversity conservation at a landscape-scale: an evaluation of current approaches and opportunities in Australia* (A report for the National Environmental Research Program, 2013); Perth Peel Strategic Assessment <http://www.environment.gov.au/protection/assessments/strategic/wa-perth-peel> and Melbourne Strategic Growth Areas plan <http://www.environment.gov.au/protection/assessments/strategic/melbournes-urban-growth-boundary> were highlighted by interview participants as examples of a more effective and proactive approach to conserving biodiversity, especially in the context of urban development proposals, despite some challenges with their implementation, eg interviews #2 (consultant), #30 (advocate).

…*where* they are'.[203] This is in contrast to systematic conservation planning which, after identifying the goals that are sought, must be able to pinpoint specific locations for new protected areas. Additional responses to the challenge of spatially and temporally constrained protected area boundaries – including for bioregional and systematic conservation planning – are proposed in Section 5.4.3.

Legal frameworks that support connectivity for biodiversity adaptation must also address the risk that, in some cases, enhanced connectivity will threaten biodiversity, including by facilitating the movement of invasive species, pathogens and bushfire into vulnerable or isolated ecosystems.[204] A precautionary approach to connectivity conservation should be underpinned by risk assessment obligations and rigorous decision-making standards. Connectivity Risk Assessment protocols, such as those developed by the NSW Environmental Trust for the *BushConnect* program,[205] could help to identify situations in which vulnerable protected areas or critical climate refugia should be kept isolated from surrounding habitat, and mitigate other potential risks of a connectivity project to biodiversity before it is approved.

5.4.2 Adopt more proactive approaches to NRS expansion

The first of the three overarching legal design principles introduced in Chapter 4 is to implement more proactive approaches to conservation. This section recommends more proactive and holistic approaches to implementing reserve criteria and targets,[206] including acquiring and designating new protected areas in anticipation of climate-driven ecological change. The statutory definition of each protected area category may also need to be

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[203] Interview #34 (government).
[204] Interview #25 (research); Prober, Suzanne M and Michael Dunlop, 'Climate change: a cause for new biodiversity conservation objectives but let's not throw the baby out with the bathwater' (2011) 12(1) *Ecological Management & Restoration* 2; Invasive Species Council, 'Corridor risk assessment needed: a submission about the draft national wildlife corridors plan', submission to the National Wildlife Corridors Plan Advisory Group (April 2012).
[205] NSW Environmental Trust, 'Bush Connect Program Corridor Risk Assessment' (NSW Department of Environment and Heritage, 2015) <www.environment.nsw.gov.au/resources/grants/150137CraBC.pdf>.
[206] Eg Trouwborst, Arie, 'International nature conservation law and the adaptation of biodiversity to climate change' (2009) 21 *Journal of Environmental Law* 419, 424; Schramm, Daniel and Akiva Fishman, 'Legal frameworks for adaptive natural resource management in a changing climate' (2010) 22 *The Georgetown International Environmental Law Review* 491, 501; Stein, BA et al (eds) *Climate-smart conservation: putting adaptation principles into practice* (National Wildlife Federation, 2014); Stein, Bruce A et al, 'Preparing for and managing change: climate adaptation for biodiversity and ecosystems' (2013) 11(9) *Frontiers in Ecology and the Environment* 502, 505-6.

re-assessed, to ensure that emerging and future biodiversity values can be effectively conserved alongside historical ecological compositions and functions.

(a) Pursuing 'CAR+' criteria for NRS expansion

While the CAR criteria are expected to remain robust targets for NRS expansion under climate change,[207] they must include a stronger focus on climate adaptation.[208] One stakeholder interviewed for this research suggested, 'we can't be blinded by [CAR]' to the exclusion of new priorities for responding to climate challenges for biodiversity within and outside the NRS.[209] Indeed, this is already recognised in practice, with the CAR criteria operating in practice alongside other, more sophisticated reserve configuration approaches, such as strategic, systematic and ecosystem-based conservation planning and management tools.[210] Legal and policy mechanisms for driving NRS expansion must emphasise adaptation priorities such as climate refugia, current and emerging critical habitat and corridors for independent adaptation, where appropriate.[211] This section describes this as a 'CAR+' approach. CAR+ criteria embrace the challenge of climate-driven change to ecological composition and functions and support greater replication of biodiversity in the NRS as insurance against loss, including from extreme events.[212]

One emerging tool for setting adaptation-oriented CAR+ priorities is the IUCN's Global Standard for the Identification of Key Biodiversity Areas ('KBAs'), launched in 2016.[213] KBAs integrate a range of established conservation priorities such as Important Bird Areas

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[207] Dunlop et al, above n 137, 173; Prober and Dunlop, above n 204, 3; Taylor, Fitzsimons and Sattler, above n 28, 55.
[208] Prober and Dunlop, above n 204, arguing for the addition of a 'Resilience' criterion, or the 'CARR' criteria.
[209] Interview #31 (regional).
[210] Interview #22 (government); Kukkala, Aija S. and Atte Moilanen, 'Core concepts of spatial prioritisation in systematic conservation planning' (2013) 88(2) *Biological Reviews* 443; Moilanen, A, KA Wilson and HP Possingham, *Spatial conservation prioritisation: quantitative methods and computational tools* (Oxford University Press, 2009); NatureServe and OpenChannels.org, *Ecosystem-Based Management ('EBM') Tools Network* <www.ebmtools.org/>.
[211] Reside et al, above n 184; Taylor and Figgis, above n 159, 3, 8; *cf* Hagerman, Shannon et al, 'Expert views on biodiversity conservation in an era of climate change' (2010) 20(1) *Global Environmental Change* 192, 202-3.
[212] Taylor and Figgis, above n 159, 8; incorporating the concept of 'redundancy' from resilience theory, discussed in Dunlop and Prober, above n 204, 3.
[213] IUCN Species Survival Commission and World Commission on Protected Areas, *A Global Standard for the identification of Key Biodiversity Areas: version 1.0* (2016) ('Global Standard for KBAs').

and Centres of Plant Diversity, with climate change criteria such as refugia.[214] KBA criteria include – and distinguish between – threatened and geographically-restricted biodiversity, irreplaceability, ecological integrity and biological processes.[215] The KBA concept also provides a rigorous methodology for measuring biodiversity change over time, representing both an acknowledgement that change is already occurring and a tool for responding to climate-driven change.[216] Almost 17% of Australia's KBAs are located entirely outside the NRS, and of the 21% wholly within the NRS, many have been assessed as inadequately managed.[217] A key starting point for overcoming persistent, low representation of these critical areas in the NRS will be integrating the concept of climate change into statutory objects, purposes and principles in protected area legislation. New legal purposes should include climate adaptation as a relevant consideration for designating Commonwealth and state statutory protected area categories.[218]

Components of biodiversity currently underrepresented in the NRS but particularly important for climate adaptation should also be a particular focus of protected area law and policy reform. For example, Australia's rivers and their dependent ecosystems are among the most commonly underrepresented biodiversity in the NRS.[219] Acre for acre, freshwater systems make up the most biodiverse biome in the world but they are overexploited and increasingly threatened because of their importance to humans.[220] Freshwater river systems are also particularly threatened by climate change and constitute an important priority for adaptation.[221] Riparian buffer zones can facilitate conservation and local adaptation, but

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[214] Ibid 1.
[215] Vine, Samantha et al, *KBAs in danger: the state of Australia's Key Biodiversity Areas in 2017* (BirdLife Australia, 2017) 5.
[216] Ibid 6; Global Standard for KBAs, above n 213, 2, 7-8.
[217] Vine et al, above n 215, 3.
[218] Section 5.2.3; eg Cliquet, An et al, 'Adaptation to climate change legal challenges for protected areas' (2009) 5(1) *Utrecht Law Review* 158, 163, referencing Folke C et al, 'Regime shifts, resilience, and biodiversity in ecosystem management' (2004) 35 *Annual Review of Ecology, Evolution, and Systematics* 557.
[219] Stein, Janet and Jon Nevill, 'Counting Australia's protected rivers' (2011) 12(3) *Ecological Management & Restoration* 200; Fitzsimons JA and HA Robertson, 'Freshwater reserves in Australia: directions and challenges for the development of a comprehensive, adequate and representative system of protected areas' (2005) 552 *Hydrobiologia* 87; freshwater protected areas are identified as a crucial priority, Taylor and Figgis, above n 159, 8.
[220] Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Synthesis* (Island Press, 2005) 32, 35, 67.
[221] Kingsford RT et al, *Protecting Australia's rivers, wetlands and estuaries of high conservation value* (Independent report to the Commonwealth Department of the Environment and Heritage, 2005); Pittcock, Jamie, 'Climate adaptation in river management in a post-stationary world' in Garrick, Dustin E et al (eds)

have not been effectively conserved under existing protected area laws.[222] Responses to this failure may include creating or strengthening protected area category designations for freshwater, water catchment and watershed protected areas, in Commonwealth and state legislation.[223] Similarly, ecosystems that are particularly sensitive to climate impacts, such as alpine ecosystems and coastal wetlands, ought to be a particular focus for NRS expansion. Despite the likelihood that these ecosystems will be transformed by climate change over the medium-to-long term, alpine and other 'upslope' areas represent particularly important sites for both independent and human-mediated biodiversity adaptation.[224]

The scaled approach of the JANIS criteria provides a well-understood mechanism that could be applied more broadly and proactively to respond to climate change in expanding the NRS.[225] Applying the JANIS criteria to all ecosystem-types, as Taylor and colleagues have done in repeat assessments of the 'completion' of the NRS, could help to improve representation of particularly endangered or particularly degraded ecosystems.[226] For example, if there is only a small proportion of a non-forest ecosystem left in Australia, or in a particular bioregion, every example of that ecosystem might need to be targeted for inclusion in the NRS. Restored examples of that ecosystem type may also need to be accommodated in protected area criteria, as discussed below. The challenges of achieving this level of representation in the NRS for ecosystems on private land are substantial. For example, a review of the Tasmanian Private Forests Reserve Program highlighted a 'realisation at an early stage of the program that it would not be possible to meet, or even approach the JANIS criteria' for every ecosystem, particularly those located solely on

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Federal rivers: managing water in multi-layered political systems (Edward Elgar Publishing, 2014); James, Cassandra S et al, 'Sink or swim? Potential for high faunal turnover in Australian rivers under climate change' (2017) 44(3) *Journal of Biogeography* 489.

[222] Mah, Darrien Yau Seng, Kelvin King Kuok Kuok and Fang Yenn Teo, 'Case study of exploited riparian corridors: rapid assessment of ecological health for riparian buffer width' (2016) 14(1) *International Journal of River Basin Management* 57.

[223] Eg under the *Catchment and Land Protection Act 1994* (Vic); Ramsar wetlands declared under the EPBC Act s 17A; for the Murray Darling River System and 'environmental' flows for conservation purposes, under the *Water Act 2007* (Cth); and parts of rivers and riparian zones in Victoria under the *Heritage Rivers Act 1992* (Vic).

[224] Eg Lenoir, J et al, 'A significant upward shift in plant species optimum elevation during the 20th Century' (2008) 320(5884) *Science* 1768; Reside et al, above n 184, 1.

[225] A key priority for NRS expansion, EDO NSW, above n 126, 31.

[226] Summarised in Taylor, above n 53, 61; a recommendation supported in interviews, #10 (NGO), #19 (NGO).

private land.[227] However, these challenges should not be used as a justification for low levels of ambition and reduced resources for achieving CAR+ criteria in the NRS.

(b) Generating environmental 'gains' for the NRS through ecological restoration

In addition to introducing CAR+ criteria for adaptation-oriented expansion of the NRS, a key component of the 'proactive' design principle is to address past environmental losses and go further than prohibiting future harm by actively promoting 'environmental gains'.[228] Dunlop and colleagues have recommended the development of 'methods for large-scale habitat restoration, especially in heavily cleared landscapes', to enhance the adaptiveness of the protected area network as a whole, as well as individual protected areas.[229] Other components of biodiversity, such as individual species populations and ecological communities, will also benefit from large-scale restoration as they adapt through range contractions or by shifting into or out of protected areas.[230]

Proactive, systematic conservation planning mechanisms offer an important starting point for this task. For example, systematic planning could be used to identify areas for adaptation-oriented restoration and then prioritise resources to improve their representation in the NRS.[231] As mentioned above, establishing new protected areas primarily or exclusively comprising restored, constructed or novel ecosystems will require expanding the number and/or the scope of existing statutory protected area category definitions.

Expanding the number or scope of IUCN protected area categories will require international agreement, which is unlikely in the near future.[232] While this may constrain EPBC Act reform in relation to the Commonwealth reserve categories, it does not represent a major challenge for the NRS as a whole, because the Commonwealth

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[227] Gilligan, Brian and Syneca Consulting Pty Ltd, *Review and evaluation of the Tasmanian Private Forest Reserves Program* (Independent report prepared for the Tasmanian Department of Primary Industries and Water, 2007) 28.
[228] Chapter 4, Section 4.3.
[229] Dunlop et al, above n 8, 8.
[230] Eg Possingham, Hugh P, Michael Bode and Carissa J Klein, 'Optimal conservation outcomes require both restoration and protection' (2015) 13(1) *PLoS Biol* e1002052.
[231] EDO NSW, above n 126, 55-59, recommending threat based planning as a key response to climate change; interview #20 (advocate); Groves et al, above n 165.
[232] Unlikely in the short-medium term, given ongoing debate about existing categories, Dudley, Nigel et al, 'The revised IUCN protected area management categories: the debate and ways forward' (2010) 44(04) *Oryx* 485.

government plays a comparatively limited role in establishing new protected areas.[233] State Parliaments, on the other hand, have more flexibility to create new protected area categories and/or redefine existing categories for promoting 'environmental gains' through NRS expansion. For example, in August 2017 the Queensland government introduced a Bill to create 'special wildlife reserves', a new category of private protected area that would have provided the strictest conservation standards for private protected areas in Australia. While the Bill lapsed when Parliament was prorogued prior to the state election in November, it demonstrates the opportunity for new protected area categories to be created at the state scale.

Minor legislative reform could begin to improve the proactivity of protected area laws for adaptation and environmental gains. For example, clarifying that a Tasmanian 'nature reserve' that must demonstrate 'unique, important… [or] representative values', can be declared where the 'unique or important values' are for *future* adaptation and conservation rather than for current biodiversity values.[234] To emphasise the importance of environmental gains, statutory reform might also include adding the phrase in italics, to the following 'purposes of reservation' for nature reserves: '…the conservation [*, restoration or improvement*] of the natural values of that area of land that are unique, important or have representative value'.[235]

Existing protected area legal frameworks provide limited guidance or incentives for ecological restoration. However, small changes to statutory category descriptions and a stronger reliance on systematic conservation planning could improve the representation of restored and improved habitat to facilitate biodiversity adaptation in the NRS.

5.4.3 Promote accountable flexibility

The second design principle introduced in Chapter 4 is to promote flexibility in conservation law, without undermining accountability for decision making as the climate changes. Accountable flexibility requires a focus on decision-making criteria and standards

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[233] Because it can only establish protected areas on (the limited amount of) Commonwealth-owned land, or with the agreement of state and/or territory governments, see CAPAD 2016, above n 20.
[234] *Nature Conservation Act 2002* (Tas) Sch 1 column 2, 'nature reserves'.
[235] *Nature Conservation Act 2002* (Tas) Sch 1, column 3, 'nature reserves' italics added.

– defining *how* decisions should be made but not constraining *what* a decision should be in any given scenario. This section considers the ‘protective’ forms of PADDD, first raised in Section 5.3.4, and the rigorous decision-making criteria that will be necessary to ensure accountability and non-regression. It also investigates the potential for improving flexibility through dynamic protected area boundaries and zoning.

(a) ‘Protective PADDD’: criteria for triage underpinned by non-regression

Efficient allocation of limited conservation resources will only become more critical under climate change. Swapping degraded areas for more diverse and healthy ecosystems has been proposed as one way to improve conservation efficiency and protected area networks more broadly.[236] This approach could also provide flexibility for private protected area conservation, where existing covenants specify management activities for biodiversity that is no longer present in the covenanted area.[237] PADDD has also been proposed as a way of de-gazetting protected areas to re-gazette them at a higher conservation status;[238] and abandoning protected areas of ‘lower value’ to free up funds to acquire higher-value areas.[239] In a climate change context, ‘protective’ uses of PADDD may include swapping land destroyed by bushfire for an unburnt area that may act as a fire refuge; or swapping land that a target species has migrated away from, for land that will cater for the species’ particular habitat needs as the climate changes.[240]

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[236] Fuller, RA et al, ‘Replacing underperforming protected areas achieves better conservation outcomes’ (2010) 466(7304) *Nature* 365; Strange, N, BJ Thorsen and J Bladt, ‘Optimal reserve selection in a dynamic world’ (2006) 131 *Biological Conservation* 33; Strange, N et al, ‘Conservation policies and planning under climate change’ (2011) 144 *Biological Conservation* 2968; McDonald-Madden, E, PWJ Baxter and HP Possingham, ‘Making robust decisions for conservation with restricted money and knowledge’ (2008) 45 *Journal of Applied Ecology* 1630; Alagador et al, above n 157.

[237] Eg shifting distributions of the Tasmanian Lowland Temperate Native Grasslands ecological community and the *Ptunnara brown butterfly,* Section 5.3.4.

[238] Pringle, RM, ‘Upgrading protected areas to conserve wild biodiversity’ (2017) 546(7656) *Nature* 91; or, as described in Taylor, Fitzsimons and Sattler, above n 28, 59, to re-gazette existing protected areas to allocate them into a protected area category that more accurately reflects their standard of protection – improving reporting accuracy and transparency for management.

[239] Eg Fuller et al, above n 236.

[240] For a discussion of this approach in the context of US market-based conservation mechanisms, Whipps N, ‘What happens when species move but reserves do not? Creating climate adaptive solutions to climate change’ (2015) 66(2) *Hastings Law Journal* 557; Kimbrell T, ‘Moving species and non-moving reserves: conservation banking and the impact of global climate change’ (2010) 22 *Fordham Environmental Law Review* 119.

As noted above, there are inherent risks in using PADDD in this way, particularly for undermining ‘redundancy’ where multiple examples of the same ecosystem ‘type’ in the NRS can enhance the network’s adaptive capacity under climate change. However, without a dramatic increase in funding, protective PADDD may be necessary to meet biodiversity adaptation needs. Alagador and colleagues have argued that de-gazetting or releasing ‘redundant’ areas – that no longer contribute to specified long-term conservation goals – can consistently improve conservation outcomes, particularly the long-term persistence of native species.[241]

Some legislation already explicitly provides for land swaps to increase the protected area estate. For example, the *Nature Conservation Act 2002* (Tas) provides that land may be acquired and declared to be a protected area ‘by the exchange for it of any Crown land, other than reserved land [including with]… payment, giving or receipt of any sums or other consideration…’.[242] While reserved land typically cannot be exchanged under these provisions, any part or all of a protected area deemed ‘less valuable’ for conservation can have its reserve status revoked to facilitate a swap.[243] This process has the potential to reduce the cost to government of acquiring land, especially private land, and to release funds for new NRS acquisitions for biodiversity adaptation.[244]

Legal reform is necessary to ensure that PADDD processes are used in a protective way, to facilitate conservation and avoid regressive outcomes that undermine the integrity and adaptive capacity of the NRS. Legal tools for revoking the status of protected areas should promote precaution and enhance accountability in decision-making. Firstly, this may include imposing a threshold legal obligation to advertise PADDD proposals, requiring consultation that is equivalent to that required to establish a new protected area – both for public and private land.[245] Secondly, to the greatest extent possible, a final decision on

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[241] Alagador et al, above n 157; Mascia and Pailler, above n 149, 16; Fuller et al, above n 236.
[242] *Nature Conservation Act 2002* (Tas) s 24(3), (4).
[243] Eg *Nature Conservation Act 2002* (Tas) s 21(1); revoking an area’s protected status may be necessary for achieving a land swap; in *Packham v Minister for the Environment* (1993) 31 NSWLR 65, the majority of the NSW Court of Appeal held that the Environment Minister could not grant an access easement over reserved land, even as a ‘swap’ for the beneficiary donating private waterfront land to be integrated into the reserve, because the easement would be inconsistent with the statutory purposes for which the reserve was created.
[244] Fuller et al, above n 236.
[245] Shalynn M Pack et al, ‘Protected area downgrading, downsizing, and degazettement (PADDD) in the Amazon’ (2016) 197 *Biological Conservation* 32, recommending the adoption of ‘national policies

using protective PADDD should not rely on the discretion of a Minister or government. Greater accountability could be provided by establishing an independent statutory authority, either to make final PADDD decisions, or at least to screen proposals to ensure that the Minister may only consider adaptive, non-regressive proposals. Statutory authorities that could play this role already exist in some jurisdictions. For example, the Victorian Environmental Assessment Council ('VEAC') provides the Victorian government with independent and strategic advice 'relating to the protection and ecologically sustainable management of the environment and natural resources of public land'.[246] VEAC has statutory functions to conduct investigations and assessments[247] and could provide advice on PADDD proposals, provided they are referred to VEAC by the Minister.[248] Thirdly, protective PADDD decisions should be required to be based on the 'best available scientific evidence'. Alternatively, legislation could require that a protected area's status only be revoked if there is independent evidence demonstrating that the revocation will result in a conservation benefit.[249]

(b) Mobile, internally dynamic and seasonally protected areas

Section 5.3.1 described the spatially and temporally stationary nature of protected area boundaries as a climate-specific challenge for biodiversity. Fixed boundaries are not a barrier to adaptation, per se, because 'protected areas [can] provide the fixed elements in a dynamic conservation plan'.[250] However, the legal design principle of promoting accountable flexibility could inform new, adaptation-oriented legal responses to fixed protected area boundaries. Such responses may include: protected area boundaries, including internal zone boundaries, that can shift spatially, in line with climate-driven species redistribution and seasonal protected areas that can provide habitat when it is most needed while allowing alternative, compatible land uses at other times.

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governing PADDD that are analogous to policies governing the initial establishment of [protected areas], including public consultation, technical studies, compensatory measures, and visual representation and explanation of the proposed changes', at 32.

[246] *Victorian Environmental Assessment Council Act 2001* (Vic) s 1(1) (purpose).

[247] *Victorian Environmental Assessment Council Act 2001* (Vic) s 6 (functions), 7 (powers).

[248] *Victorian Environmental Assessment Council Act 2001* (Vic) s 15 (Minister may request an investigation), s 17 (investigation must be effectively resourced), s 26B (Minister may request assessments or advice).

[249] *Cf* Pringle, above n 238, arguing that protected areas should be upgraded not abandoned.

[250] Hannah L and L Hansen, 'Designing landscapes and seascapes' in TE Lovejoy and L Hannah (eds) *Climate change and biodiversity* (Yale University Press, 2005) 333.

Firstly, areas with highly mobile species or particularly important or vulnerable ecosystem functions may benefit from legal protection that has the capacity to track dynamic biodiversity components as they shift and adapt. This may involve creating dynamic protected areas, where area boundaries shift in line with projected species movement as climate change effects become apparent.[251] Boundaries may be stationary for particular periods, with step changes as permanent changes in species distributions are observed, or fluid, depending on the location of particular defined, important ecological values.[252] Mobile protected areas have only been implemented in marine environments to date, as 'dynamic marine protected areas'.[253]

While terrestrial biodiversity in Australia is unlikely to shift at the rate and scale of, for example, pelagic fish and marine mammals, an equivalent tool for establishing terrestrial dynamic protected areas may become appropriate under climate change.[254] However, such a mechanism is not supported by current terrestrial conservation laws, and is likely to face significant challenges in that sphere. In the context of deeply-held expectations about private property use, dynamic terrestrial conservation mechanisms may result in perverse outcomes. For example, proactive destruction of potential habitat; increased habitat restoration costs and potential land use conflict; or incentivising the unsustainable use of land onto which a mobile boundary will shift in future, to maximise its immediate economic returns.[255]

Another mechanism for more dynamic protected areas, to overcome the adaptation challenges of stationary protected area boundaries, is to implement 'internally dynamic' zoning within large protected areas. Adaptation-oriented zoning can facilitate internal

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[251] Game, ET et al, 'Dynamic marine protected areas can improve the resilience of coral reef systems' (2009) 12(12) *Ecol Lett* 1336.
[252] There is limited literature on the practical legal expression of dynamic or mobile protected areas, but see Hobday, AJ et al, 'Dynamic ocean management: integrating scientific and technological capacity with law, policy, and management' (2014) 33(2) *Stanford Environmental Law Journal* 125.
[253] Hobday, Alistair J et al, 'Missing dimension: conserving the largest habitat on Earth: protected areas in the pelagic ocean' in J Claudet (ed) *Marine Protected Areas* (Cambridge University Press, 2011) 347, 366, noting that '…dynamic spatial protection may be the way of the future'; Hobday, Alistair J, 'Sliding baselines and shuffling species: implications of climate change for marine conservation' (2011) 32(3) *Marine Ecology* 392.
[254] Hoag, H, 'Confronting the biodiversity crisis' (2010) 4 *Nature Reports Climate Change* 51, 53-4, suggesting that 'a whole population of [terrestrial] animals threatened by climate change could be tagged with microscopic trackers and followed through space and time, allowing the protected space to be modified as the animals move seasonally to feed and breed'.
[255] Interview #22 (government), describing perverse outcomes from past environmental law reform.

flexibility while minimising or avoiding conflict with neighbouring landholders. Protected areas can be zoned when they are established, or at a later time.[256] Protected area zones define permitted, discretionary or prohibited activities in particular parts of a protected area, for example by allowing recreational and scientific uses in some areas while restricting access to others. Large protected areas, such as the Tasmanian Wilderness World Heritage Area ('TWWHA'), could establish internally dynamic zone boundaries that shift according to species or ecosystem movement or climate vulnerability, while retaining appropriate opportunities for sustainable use in areas with higher levels of adaptive capacity or reduced climate sensitivity.[257] At present, statutory zoning plans and protected area management plans typically require that zones incorporate spatially defined, 'specified' lands.[258] This means that a zone must usually be revoked and a new zone proclaimed to achieve 'internally dynamic' approaches as ecological values shift. The use of internally dynamic zoning could be readily improved with minor legal reforms,[259] and a clear policy statement that zones be used in this way to facilitate adaptation.

A second legal mechanism to address the spatial and temporal stationarity of protected area boundaries, though still in its infancy, is seasonal protected areas. Conserving land 'in perpetuity' is recognised as an important characteristic of formal protected areas. However, achieving expansion of the NRS sufficiently rapidly to meet even the conservative Aichi Target of 17% of each of Australia's bioregions – as opposed to 17% of the continent as a whole – by 2020 will be extremely challenging.[260] Moreover, as climate change triggers landscape scale biodiversity changes, permanent protected areas may not be possible,

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[256] Eg EPBC Act s 346, new Commonwealth reserves must be assigned an IUCN category; s 346(2) allows a proclamation to 'divide a reserve into zones and assign each zone to an IUCN category'; s 367(2) provides that a management plan may allocate different zones within a protected area into different categories; s 350 provides for the revocation and alteration of Commonwealth reserves by proclamation, including to achieve a reallocation of land within a reserve from one permanent zone to another.
[257] The TWWHA is made up of a large number of smaller protected areas, ranging from IUCN categories Ia, II, III, IV and V; Tasmanian Parks and Wildlife Service, *Tasmanian Wilderness World Heritage Area (TWWHA) Management Plan* (DPIPWE, 2016).
[258] Including published in the government gazette and, in some cases, approved by both houses of Parliament, eg *National Parks and Wildlife Act 1975* (Vic) s 22.
[259] Eg by allowing zones to be amended when defined environmental thresholds are reached, without requiring additional proclamations or management plan revisions, provided the amendments do not amount to a regression in conservation standards, Chapter 4.
[260] Vine et al, above n 215, 19.

economically feasible, appropriate or even necessary in some cases.[261] Temporary conservation measures may help to fill this gap. Some opportunities already exist in protected area legislation. For example, the *Nature Conservation Act 2002* (Tas) allows the Minister to take a lease over any land that meets statutory protected area criteria and, for the term of the lease, declare that land to be a protected area.[262] In some landscapes, especially those dominated by private land, additional short term or seasonal legal mechanisms may be necessary to conserve important habitat for adaptation.[263]

The Nature Conservancy has developed a novel response to this challenge, addressing spatial and temporal habitat 'gaps' for annual waterbird migrations across Northern America by creating new conservation 'markets'.[264] Since 2014, farmers in California's Sacramento Valley have participated in annual reverse auctions, in which successful bidders receive conservation funding to leave rice fields flooded for longer than usual, creating ephemeral wetland habitat for waterbird foraging in key migration periods.[265] Seasonal conservation could complement permanent habitat conservation in the NRS[266] and reduce the significance of uncertainty about *where* to purchase or covenant permanent protected areas for future adaptation, optimising conservation outcomes relative to costs.[267] The Nature Conservancy's work also supports co-benefits for participating farmers, who generate income in the 'off-season' for their rice crops, building public support for future conservation projects.[268] 'Bitterns in Rice' ('BiR') is a similar initiative in the rice-growing region of the NSW Riverina, but is focused on research and co-management, rather than

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[261] Interviews #22 (government), #23 (consultant); Rissman, AR. 'Evaluating conservation effectiveness and adaptation in dynamic landscapes' (2011) 74 *Law & Contemp Probs* 145; with the possible exception of critical refugia, to provide relatively more stable habitat, eg Reside et al, above n 184.
[262] *Nature Conservation Act 2002* (Tas) s 15(1); *National Parks Act 1975* (Vic) s 19E; EPBC Act s 344(1).
[263] Including by restricting grazing or human access to specified areas at certain times of year, such as when native grasses are flowering and seeding or during the breeding season of particular fauna; buffer zones may also be imposed to facilitate reproductive success, eg for endangered eagles, including with strict restrictions on approaching nesting trees, when they are in use, Dennis, Terry E, Rebecca R McIntosh and Peter D Shaughnessy, 'Effects of human disturbance on productivity of White-bellied Sea-Eagles (*Haliaeetus leucogaster*)' (2011) 111(2) *Emu* 179.
[264] Reynolds, Mark D et al, 'Dynamic conservation for migratory species' (2017) 3(8) *Science Advances*: e1700707, describing 'dynamic conservation strategies that tailor the delivery of habitat to when and where it is most needed' as a critical response to unprecedented global change.
[265] Ibid.
[266] Taylor, Fitzsimons and Sattler, above n 28, 5.
[267] Reynolds et al, above n 264.
[268] Reynolds et al, above n 264.

conservation markets.[269] BiR engages local farmers who agree to support wildlife habitat by modifying their farming practices.[270]

Seasonal conservation primarily benefits highly migratory species that use grassland or ephemeral wetland habitats, and will not provide any support to species, for example, that rely on old-growth forests or significant landscape features such as ‘paddock-trees’ for habitat. Nevertheless, seasonal conservation initiatives deserve more attention for application in Australia, to increase the flexibility of the NRS and supplement permanent protected areas across the continent.

5.4.4 Prioritise adaptive management approaches

Increasing and enhancing the protected area estate will require a new or expanded focus on reducing vulnerability and increasing adaptive capacity through adaptation-oriented management. Management in the NRS must emphasise conserving climate refugia within existing protected areas, and managing protected areas with clear links to broader, bioregional landscape management. However, legal frameworks for protected area management in Australia create challenges for adaptive management approaches. The nature and extent of these challenges, and recommendations for reform, are the subject of Chapter 6 of this thesis.

5.5 Conclusion

Despite significant growth in the NRS over the past decade, responding effectively to climate change will require a shift in the way that protected area laws guide and facilitate the creation of new protected areas. The emphasis of existing laws on ‘setting aside’ land into the NRS, to conserve particular parcels of land and their constituent biodiversity in a ‘natural’ and unchanging state will be fundamentally challenged, and probably unachievable, as the climate changes.[271] Indeed, a growing body of research suggests that resisting change will not only *not* prevent species extinctions and ecosystem

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[269] BiR, ‘Bitterns in Rice Project’ <https://www.bitternsinrice.com.au/about-birp/>; Herring, M and A Silcocks, ‘The use of rice fields by the endangered Australian Painted Snipe (*Rostratula australis*): a rare opportunity to combine food production and conservation?’ (2014) 66 *Stilt* 20.
[270] BiR, ‘Bittern friendly rice growing tips’ <https://www.bitternsinrice.com.au/bittern-friendly-rice-growing-tips/>.
[271] McDonald et al, above n 118.

transformations, but may lead to more rapid or abrupt changes when a system or population reaches the limits of its tolerance for change.[272]

NRS expansion must be pursued in a way that is proactive and flexible without lowering conservation standards. This should include renewed effort to achieve the comprehensive and representativeness that is already prioritised in existing law and policy. Funding will be essential to achieve the ‘completion’ of the NRS, along with political and community support. However, both funding and community support for NRS expansion, and especially for establishing new public protected areas, is currently low.[273] Legal reform should focus on the nature and location of protected area boundaries and the connection between ‘core’ highly-protected areas, buffer zones, and biodiversity distributed or migrating across non-protected landscapes. Seasonal and dynamic conservation mechanisms will become increasingly important for this purpose, but protected areas conserved ‘in perpetuity’ should continue to be a key focus of effort and resources.[274]

In the meantime, adaptation-oriented law and policy reform will also be necessary to improve adaptation within existing protected areas in the NRS. The next chapter focuses on the laws and policies that direct protected area management in the NRS. Chapter 6 explores how statutory protected area management plans are influenced by the underpinning ‘stationarity’ and ‘wilderness’ conservation paradigms in law. Building on the analysis in this chapter, Chapter 6 highlights the site-specific challenges of the same legal failure identified here: of not acknowledging and responding to the threat that climate change poses to the protected area network and Australian biodiversity more generally.

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[272] Steffen et al, above n 12; Heller and Zavaleta, above n 6; Mawdsley et al, above n 6.
[273] Interview #4 (consultant), #7 (government), #35 (government).
[274] Taylor et al, above n 33, 50.

Chapter 6 Enhance the protected area estate: adaptation-oriented management

6.1 Introduction

Chapter 5 was the first of four chapters to investigate, in detail, the legal frameworks for individual adaptation strategies in Australian law and policy. Chapter 5 focused on establishing new protected areas, both for *expanding* the National Reserve System ('NRS') (protected area strategy) and improving landscape-scale connectivity (connectivity strategy). However, facilitating adaptation with the protected area strategy will require both an expanded and an *enhanced* protected area estate.[1] This chapter addresses the second component, identifying opportunities to enhance the capacity of biodiversity to adapt as the climate changes, through legal and policy tools for protected area management in Australia.

This chapter links closely with Chapter 5, recognising that all protected areas, even those that are established to facilitate climate adaptation, must also be managed in a way that anticipates inevitable, potentially transformational, climatic and ecological change. This chapter also considers laws and policies to implement the connectivity strategy, because the NRS does not yet contain a comprehensive, adequate or representative suite of Australian biodiversity,[2] and climate change will drive species redistribution both into and out of protected areas from surrounding, non-protected landscapes.

Land managers must explicitly define appropriate management goals and a plan for managing an area before that area can be recognised as part of Australia's NRS.[3] Protected area management has traditionally focused on maintaining or returning to historical baselines for ecological health and species assemblages. Management also focuses

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[1] Chapter 3, Section 3.3.1.
[2] See discussion in Chapter 5, Section 5.3.2.
[3] Commonwealth Department of the Environment and Energy, *Minimum requirements for contributing to the comprehensiveness, adequacy and representativeness of the National Reserve System through Caring for our Country funding* (nd) ('Standards for inclusion in the NRS') 'good management' includes: classifying and managing the area in accordance with one or more International Union for the Conservation of Nature ('IUCN') management categories; adaptively managing the area to minimise loss of biodiversity values; and monitoring and evaluating management effectiveness in a manner open to public scrutiny, at 2.

almost-exclusively on biodiversity within the boundaries of protected areas, and is typically isolated from the management and regulatory goals of surrounding land used for agriculture, forestry and mining, among other things. However, climate-driven changes across landscapes, including to fire regimes, rainfall and temperature patterns, will overwhelm stationary and 'isolationist' protected area management.[4] Indeed, climate-related challenges are likely to be more significant for protected area management than for the task of expanding the NRS, at least in the near term.[5] As the effects of climate change on biodiversity in the NRS increase over coming decades, this chapter argues that legal frameworks must take a more proactive approach to conservation, focused on facilitating adaptation, creating environmental 'gains' and conserving novel forms of biodiversity and emerging climatic refugia.

This chapter proceeds in Section 6.2 with an outline of the legal framework for protected area management,[6] which includes mechanisms for setting management targets; creating and revising management plans; and prioritising and assessing the outcome of management actions.[7] As in Chapter 5, Section 6.2 takes a nested approach, describing the legal and policy system for NRS management with examples drawn primarily from the Commonwealth, Victoria and Tasmania.[8] Section 6.2 also highlights the role of overarching statutory principles in management planning, drawing on the discussion in Chapter 4, including about the underpinning paradigms that may challenge adaptation-oriented conservation management. Finally, Section 6.2 introduces the framework for statutory management planning in Australia. Statutory plans are both (a) the key legal mechanism for articulating protected area management goals and directing site-specific activities; and (b) the subject of a comprehensive content analysis in the nested research jurisdictions, the results of which underpin the remainder of this chapter.

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[4] Dudley, Nigel et al, 'Where now for protected areas? Setting the stage for the 2014 World Parks Congress' (2014) 48(04) *Oryx* 496, 499; Fischman, R, 'Leveraging federal land plans into landscape conservation' (2016) 6 *Geo. Wash.J. Energy & Envtl. Law* 46; Meretsky, VJ and R Fischman, 'Learning from conservation planning for the U.S. National Wildlife Refuges' (2014) 28(5) *Conservation Biology* 1415, 1424-5.
[5] Dunlop, M and PR Brown, *Implications of climate change for Australia's National Reserve System* (A preliminary assessment report to the Commonwealth Department of Climate Change, 2008) 120.
[6] In answer to research question ('RQ') III: *To what extent are these strategies currently represented in Australia's legal frameworks for conservation?*
[7] Hawke, Allan, *The Australian Environment Act: report of the independent review of the Environment Protection and Biodiversity Conservation Act 1999* (Report to the Commonwealth Department of the Environment, Water, Heritage and the Arts, 2009) 182.
[8] In keeping with the methodology described in Chapter 2.

Section 6.3 presents the results of that statutory management plan analysis, illustrating both opportunities and limitations for biodiversity adaptation in Australian law.[9] Section 6.4 draws on the management plan analysis to demonstrate both legal and practical challenges for facilitating biodiversity adaptation. As in Chapter 5, these challenges include widespread failure to acknowledge and respond to climate challenges for protected area management, and shortfalls in implementing existing legal commitments. Section 6.5 makes recommendations to improve appropriate connectivity through protected area management laws and policies. That section then mirrors the approach to recommendations taken in Chapter 5, using the three design principles – proactivity, accountable flexibility and adaptive management – to frame recommendations for implementing the protected area strategy through NRS management.[10]

6.2 Legal framework for managing protected areas

Protected area management laws operate within a broader system of protected area governance. This section describes the management system, overarching law and policy principles for protected area management, and the central role of statutory management planning in applying those laws, policies and principles to site-based management actions.

6.2.1 The protected area management system

Laws and policies for managing the NRS are part of a broader protected area management system, and should be understood in the institutional, resourcing and political context of the system as a whole. Australia's cooperative NRS Programme has invested hundreds of millions of dollars of public funding in the creation and rapid expansion of the protected area estate on public, private and Indigenous-owned land.[11] The NRS Programme also sets

[9] In answer to RQIV: *To what extent do Australian legal frameworks for conservation hinder or promote the effective implementation of these strategies?*
[10] In answer to RQV: *How can Australian law be reformed to improve the representation and implementation of these strategies?* These three design principles are set out in full in Chapter 4, Section 4.3.
[11] Gilligan, B, *Evaluation of the National Reserve System Programme* (Independent report to the Commonwealth Department of the Environment and Energy, 2006) ('NRS Evaluation 2006').

explicit objectives for developing and applying 'best practice management principles' for Australia's public and private protected areas.[12]

The national *Strategy for Australia's National Reserve System 2009-2030* ('NRS Strategy') provides the national strategic framework that guides NRS management, including on emerging issues such as climate change.[13] The NRS Strategy is intended to be implemented through five-year state plans, in conjunction with Commonwealth and state and territory legal frameworks. Implementation plans are not readily available online, and it is unclear whether any such plans have been developed.[14]

National, state and territory laws set overarching protected area management goals, informed by Australia's international environmental obligations.[15] Legislation also allocates responsibility for managing NRS protected areas in particular ways. For example, managing public protected areas is a task for government parks and wildlife agencies or statutory authorities, such as Parks Victoria. Public protected areas are also sometimes managed in informal or formalised co-management arrangements with Traditional Owners.[16] Public protected area agencies have responsibility for managing public and co-managed protected areas in line with agency mandates,[17] strategic and corporate plans,[18] and through the development, implementation and periodic review of statutory protected area management plans.[19] In private protected areas, land managers must demonstrate appropriate management planning to incorporate their property into the NRS and to access tax incentives and other management support. A private protected area

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[12] Ibid 5-6; Commonwealth Government funding was abolished in 2013 and has not been restored, Taylor, MFJ, *Building nature's safety net 2016: the state of Australian terrestrial protected areas 2010-2016* (WWF-Australia, 2017) 3.
[13] Natural Resource Management Ministerial Council, *Australia's Strategy for the National Reserve System 2009–2030* (2010) ('NRS Strategy') eg that protected area management must find 'a balance between facilitating changes and conserving elements of biodiversity that are particularly valued but threatened', at 15.
[14] Commonwealth and state statutory management plans rarely mention the NRS Strategy, in part because many plans were published before the NRS Strategy was drafted and have not been reviewed since that time.
[15] Chapter 4, Figure 4.1.
[16] Eg *National Parks Act 1975* (Vic) s16B; *Conservation, Forests and Lands Act 1987* (Vic) Pt 8A, Div 5.
[17] Eg in the objects or purposes of legislation establishing the agency, such as Parks Victoria, which is established under the *Parks Victoria Act 1998* (Vic) and delegated government authority for managing public protected areas in Victoria, s 7.
[18] Such as strategic plans for bushfire and invasive species management, eg Parks Victoria, *Annual Report 2015-16: conserving Victoria's special places* (Victorian Government, 2016).
[19] Section 6.2.3.

management plan may be developed in collaboration with government agencies or statutory authorities such as Victoria’s Trust for Nature, and may form part of a conservation covenant registered against a property title.[20]

6.2.2 Overarching law and policy principles for protected area management

High-level legal and policy principles guide protected area management at each governance scale. While specific provisions of statutory management plans typically prevail in the event of a conflict with overarching legal and policy principles, those overarching principles play a significant role in management planning, influencing the development of site-specific management goals and directing management in those areas without a management plan.[21]

Internationally, the *IUCN Guidelines for applying protected area management categories* (‘IUCN Guidelines’) list overarching management objectives that should be common to protected area management across the world.[22] These include: adaptive principles such as conserving biodiversity function and evolutionary potential; contributing to regional strategies for buffer zones and corridors; and monitoring the implementation of legal obligations to support adaptive management over time.[23] The IUCN Guidelines also require that management for each particular protected area maintains – in perpetuity – the biodiversity values for which the area was assigned.[24] If this is interpreted to require a management focus on biodiversity values, such as ecosystem health and function, the guidelines may support flexibility as the climate changes.[25]

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[20] Eg *Nature Conservation Act 2002* (Tas) s 25; *Conservation, Forests and Lands Act 1987* (Vic), ss 68-82.
[21] Eg *National Parks and Reserves Management Act 2002* (Tas) Pt 3, especially ss 20(11), 30; *National Parks Act 1975* (Vic) s 4 *cf* s 17; *Wildlife Act 1975* (Vic) ss 16, 16A.
[22] Dudley, N (ed), *IUCN guidelines for applying protected area management categories* (IUCN Publications Services, 2008) 12.
[23] Ibid; *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) (‘EPBC Regs’) Sch 8, Pt 1, eg cl 1, 2, 6 require, in all Commonwealth reserves, broad and meaningful community participation; effective and adaptive management with the capacity to respond to uncertainty and change; and transparent decision making.
[24] Dudley, above n 22, 12.
[25] But ‘stationary’ conservation approaches will not be helpful as climate change triggers dramatic and irreversible shifts in species distributions and ecosystem functions, McDonald, Jan et al, ‘Rethinking legal objectives for climate-adaptive conservation’ (2016) 21(2) *Ecology and Society* 25; Steffen, W et al,

While the IUCN Guidelines are not directly implemented in Australian law, all Commonwealth protected areas must be managed in a way that is consistent with the 'Australian IUCN Reserve Management Principles', set out in the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth).[26] The Australian IUCN Reserve Management Principles are overarching administrative principles that include effective and adaptive management, ecologically sustainable use of natural resources and transparency in decision making.[27]

Commonwealth, state and territory statutes also assign new protected areas into a management category according to their natural and/or cultural values; which designate a 'level of protection' that is deemed appropriate for each area.[28] There is little consistency across states and territories in the categories established under these statutes, but they include national parks, wilderness areas, state and nature reserves, historic sites or parks, flora and fauna reserves and private nature reserves.[29] These categories directly inform the management principles and priorities applicable to an area under Australian law, including how flexible a management agency can be in facilitating climate adaptation. For example, management objectives for a 'highly protected' categories may include 'preserving the natural, primitive and remote character of wilderness areas',[30] or protecting and enhancing a park 'as a wilderness', including by taking all practicable measures 'to preserve and protect− the natural environment, including indigenous flora and fauna…'.[31] Protected

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Australia's biodiversity and climate change: a strategic assessment of the vulnerability of Australia's biodiversity to climate change (Biodiversity and Natural Resource Management Adaptation Team, Commonwealth Department of Climate Change, 2009) 42-46; Cliquet, An et al, 'Adaptation to climate change legal challenges for protected areas' (2009) 5(1) *Utrecht Law Review* 158, 167; private land may be the subject of static conservation management objectives as readily as public land, so a combination of regional and local management objectives as well as clear, overarching adaptation objectives for the whole NRS, will likely be needed, eg Dunlop, Michael et al, *Climate-ready conservation objectives: a scoping study* (National Climate Change Adaptation Research Facility, 2013) 40-41.

[26] EPBC Act s 348; EPBC Regs reg 10.04, Sch 8, Pt 1 ('general administrative principles').

[27] EPBC Regs Sch 8, cls 2, 5, 6.

[28] Chapter 5, Section 5.2.2, designating protected areas.

[29] Eg *Nature Conservation Act* (Tas) s 16; *National Parks Act 1975* (Vic) s 4.

[30] *National Parks and Reserves Management Act 2002* (Tas) Sch 1.

[31] *National Parks Act 1975* (Vic) s 17A(2), s 17 (national and state parks); Parks Victoria has also developed a strategic system for guiding management in conservation reserves declared under the *Crown Land (Reserves) Act 1978* (Vic), setting overarching management directions, guiding principles and strategies rather than drafting individual management plans: Parks Victoria, 'Conservation reserve management system' (2003) <http://parkweb.vic.gov.au/__data/assets/pdf_file/0003/312186/21_1467.pdf>.

areas that do not have an individual statutory management plan must be managed in accordance with these overarching objectives and principles.[32]

6.2.3 Statutory management plans

Protected area management planning connects high level, international, national and strategic agency goals to on-ground management actions, including for conserving threatened biodiversity and managing stressors such as invasive species and recreational activities within reserves. Management plans must be prepared for all public protected areas under Commonwealth and most state and territory legislation.[33] Agencies may also prepare management plans for private protected areas, in negotiation with the relevant land owners.[34] While Indigenous Protected Area (‘IPA’) managers must demonstrate that they have engaged in management planning to receive public financial support, and for the area to qualify for inclusion in the NRS, there is no statutory requirement for IPAs to have management plans.[35]

Protected area management statutes impose detailed substantive and procedural obligations on both the management planning process and the content of plans. These obligations are often procedural in nature, rather than focused on conservation outcomes for biodiversity.[36] Procedural obligations include advertising draft plans, meeting detailed consultation requirements, responding to submissions and publishing individual plans in government gazettes.[37] Content obligations typically include a providing a detailed, spatial description of the protected area and its natural values – at the time that the area was declared – and

[32] Eg *National Parks and Reserves Management Act 2002* (Tas) ss 5(3), 30(1)(b); EPBC Act s 357.
[33] Eg EPBC Act s 316 (world heritage properties), s 366 (Commonwealth reserves); *National Parks Act 1975* (Vic) s 17(2)(d); *National Parks and Reserves Management Act 2002* (Tas) s 20(2); *Conservation and Land Management Act 1984* (WA) s 54(1).
[34] *National Parks and Reserves Management Act 2002* (Tas) s 20(8) (consultation with landowner required); s 19(8), (9) (approval is subject to the landowner’s consent).
[35] Management plans are developed collaboratively; on the development of joint management and collaborative planning approaches, Ross, H et al, ‘Co-management and Indigenous Protected Areas in Australia: achievements and ways forward’ (2009) 16(4) *Australasian Journal of Environmental Management* 242; Hill, Ro et al, *Our Country our way: guidelines for Australian Indigenous Protected Area management plans* (Queensland Government, 2011).
[36] Eg Chapter 4, Section 4.2.2.
[37] Eg EPBC Act s 36870; *National Parks and Reserves Management Act 2002* (Tas) Pt 3.

details about how those values will be protected in perpetuity.[38] Statutory management plans for public protected areas are typically supported by non-statutory plans that guide agency operations and reporting. Non-statutory plans include *operational* plans or 'works programmes', for allocating staff and resources to particular management actions, and *thematic* plans apply to specific issues such as threatened species and fire management.[39]

Statutory management plans can create and restrict the exercise of statutory powers, such as issuing leases and licences for activities in reserves.[40] Statutory plans can also prohibit particular activities within a protected area including through zoning or overlays,[41] restrict or prevent access to particular locations or zones,[42] and detail the locations and circumstances in which certain activities may take place in protected areas.[43] Reactive legal controls that govern use, access and development in protected areas are beyond the scope of this chapter, which focuses instead on opportunities to design or improve *proactive* legal approaches to facilitate adaptation in protected area management.

Statutory plans may be drafted by government agencies but are increasingly outsourced to consultants.[44] In an era of tightly constrained conservation budgets,[45] these management plans are often drafted in a pro forma style with limited specificity or direction about day-to-day management decisions.[46] Private protected area management plans may also rely on pro forma provisions and, at least until recently, individual private protected area land

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[38] EPBC Act s 367(1)(a), s 367(1)(c), s 367(1)(g); *National Parks and Reserves Management Act 2002* (Tas) s 27; *cf Wildlife Act 1975* (Vic) which does not create any obligations as to the content of management plans for Victorian state wildlife reserves and nature reserves.
[39] Lockwood M, 'Management Planning' in Lockwood, Worboys, Kothari (eds) *Managing protected areas: a global guide* (Earthscan, 2006) 292, 292.
[40] Eg *Wildlife Act 1975* (Vic) s 19 sets limitations on mining in state wildlife or nature reserves.
[41] Eg zoning in Tasmania is directed by the Tasmanian Parks and Wildlife Service, *Draft General Management Plan* (unpublished, 2009); in *National Parks Act 1975* (Vic) Sch 5 (wilderness zones), Sch 6 (remote and natural areas); EPBC Act s 367(2).
[42] Eg '[a] management plan for any reserved land may declare that the reserved land, or any part of the reserved land, is a restricted area to which the public does not have a general right of access', *National Parks and Reserves Management Act 2002* (Tas) s 37.
[43] Eg Tasmanian Parks and Wildlife Service, *Tasmanian Wilderness World Heritage Area management plan* (2016) 32; planning legislation and planning schemes may also apply in some areas, eg *National Parks and Reserves Management Act 2002* (Tas) s 48; Wilson, S, 'The assessment of ecotourism developments in Tasmania' (2016) 2 *NELA Environment and Climate Change Law Library* 1, 2.
[44] For discussion on the shift from highly-skilled, departmental technical planners to outsourcing and 'pro-forma' planning, Lockwood, above n 39, 294-5.
[45] Ibid; an issue raised in many interviews but, in relation to management planning, especially interviews #4 (consultant); #7 (government); #30 (advocate); #35 (government).
[46] Lockwood, above n 39.

managers often received little supervision, support or effective enforcement of management conditions after reservation.[47]

At both Commonwealth and state scales, when a management plan has been prepared, the managing authority must manage the area in accordance with that plan and may not contravene or authorise any other person to do or omit to do anything that would contravene a plan.[48] However, commitments to take into account, and not to contravene, the terms of a management plan do not extend to requiring that a plan be implemented or its goals achieved.[49]

Commonwealth and state protected area statutes also typically require protected area agencies to review management plans at regular intervals. In the EPBC Act and the *National Parks Act 1975* (Vic), management plans must be reviewed every ten years.[50] In Tasmania the obligation is vague, simply requiring that the Director keep statutory management plans 'under review'.[51]

6.3 Results: how adaptation-oriented are statutory protected area management plans

This section sets out the results of a detailed content analysis of 143 Australian statutory protected area management plans, designed to identify opportunities and hurdles for enhancing biodiversity adaptation through legal frameworks for NRS management.[52] Every Commonwealth reserve has a current plan, which is unsurprising given that the Commonwealth's terrestrial protected area estate includes just ten protected areas,

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[47] Rissman, Adena R and Van Butsic, 'Land trust defense and enforcement of conserved areas' (2011) 4(1) *Conservation Letters* 31; Hardy, Mathew J et al, 'Exploring the permanence of conservation covenants' (2017) 10(2) *Conservation Letters* 221; NRS Evaluation 2006, above n 11, 5-6.
[48] Eg EPBC Act s 362 (Commonwealth agencies and officers must not act inconsistently with the plan), s 318 (world heritage properties); EPBC Regs reg 17.03; *National Parks and Reserves Management Act 2002* (Tas) s 30(a), (b).
[49] Chapter 4, Section 4.2.2; interview #21 (advocate), highlighting the need for legal obligation to *implement* management plans, while legal obligations to *achieve* planned goals might be unrealistic or even perverse as the climate changes.
[50] Eg Management plans for Commonwealth areas must be reviewed every five years, *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 319; and in Queensland every ten years, *Nature Conservation Act 1992* (Qld) s 125.
[51] *National Parks and Reserves Management Act 2002* (Tas) ss 7, 14.
[52] The methodology, methods and justification for this research is set out in full in Chapter 2, Section 2.4.6.

governed under seven individual plans.[53] State and territory protected areas make up the vast majority of the thousands of individual protected areas and the millions of hectares of public protected area estate; and a large proportion of those areas have no management plan.[54] However, the 143 plans analysed for this research detail the management arrangements for 453 unique protected areas,[55] and demonstrate a broad spectrum of planning approaches to the challenge of climate change on public land in the NRS.

Together with the results of an analysis of 'key informant' research interviews,[56] these data reveal a gap between the explicit obligation to document protected area management in a particular way, and the practice of management planning which, often as a result of resource constraints, tends to be more opportunistic. The results set out here indicate three issues of particular significance to climate adaptation: a failure to acknowledge climate change in management planning; limited recognition and planning directed at conserving climate refugia; and a trend towards incorporating adaptive management processes in planning documents.

6.3.1 Acknowledging climate change as a challenge

The starting point for this analysis was two recent, independent reports to government, detailing the implications of climate change for Australia's NRS. The first report assessed the implications of climate change for the NRS, generally.[57] The second report considered

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[53] Commonwealth Department of the Environment and Energy, 'CAPAD 2016' <http://www.environment.gov.au/land/nrs/science/capad/2016>, 'Commonwealth summary' records seven Commonwealth national parks and three botanical gardens, including the Commonwealth offshore territories of Norfolk Island, Christmas Island and Pulu-Keeling.
[54] Ibid; the CAPAD 2016 'National summary' records 10,590 individual protected areas covering more than 150 million hectares; Parks Victoria's Conservation reserve management strategy, above n 31, concedes that '[t]he development of management plans for protected areas is costly in terms of operational budgets and staff time … [with] almost 2800 reserves [under Parks Victoria's control], the development of plans for all reserves would be a major undertaking and a considerable drain on resources into the foreseeable future', at 41.
[55] Comprising: 8 Commonwealth, 97 Victorian and 38 Tasmanian plans; date of publication ranges from 1988 to 2016; most plans were in final form but 11 were draft plans, some of which have been finalised since this review was conducted in April 2016; Appendix 4 lists the name, date and status of all of the plans reviewed for this research, including full, formal references – plan references are truncated in this chapter, for the purposes of brevity.
[56] Chapter 2, Section 2.4.4.
[57] Dunlop, Michael et al, *The implications of climate change for biodiversity conservation and the National Reserve System* (Final synthesis report prepared for the Australian Government, CSIRO Climate Adaptation Flagship, 2012); Dunlop and Brown, above n 5, is the preliminary report about the modelling data and other research findings that underpin the 2012 'final synthesis' report.

the climate-readiness of Commonwealth reserve management, in particular.[58] The first report found that the key climate threats to protected areas include altered fire regimes, the arrival of new native and exotic species, changing land use and altered hydrology.[59] It argued that the complexity of projected climate changes and their interaction with existing threats provides a strong imperative for climate adaptation to be a crucial focus of protected area management planning.[60] Both reports found that the projected impacts of climate change had not been given sufficiently high priority in NRS planning.

Some management plans reviewed for this research were more than 20 years old – despite statutory requirements to review them more often – and many plans did not even mention the concept of climate change. In all, 39 of the 143 management plans in this review mentioned one of the climate change search terms identified in Chapter 2, including global warming, sea level rise or climatic change (Figure 6.1). Thirty-four of those plans describe climate projections and potential impacts, relating them to the specific reserve.[61] While some plans only referred to the concept of climate change in passing,[62] 29 plans contained specific goals and management actions to address climate change risks to a range of protected area values. Some plans dedicated a whole section to identifying projected climate changes relevant to the specific protected area,[63] while others such as the *Ngootyoong Gunditj Ngootyoong Mara* South West Management Plan ('NGNM South West plan') have integrated climate change information throughout the plan.[64]

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[58] Hyder Consulting, *The impacts and management implications of climate change for the Australian Government's protected areas: final report* (Report prepared for the Commonwealth Department of the Environment, Water, Heritage and the Arts, and the Department of Climate Change, 2008).
[59] Dunlop et al, above n 57.
[60] Ibid 6-7; Dunlop et al, above n 25; Londono, JM et al, 'Protected areas as natural solutions to climate change' (2016) 22(1) *Parks* 7.
[61] A total of 176 references.
[62] Eg the *Lake Johnston Nature Reserve Management Plan 1999* (Tas) ('Lake Johnston MP') states that '[t]he threat to the Reserve could become an issue if the higher end predictions for global warming provide the conditions for Phytophthora cinnamomi to increase its altitudinal range', at 16; this is the only reference to the concept of climate change in the entire 50 page plan.
[63] Eg the *Wellington Park Management Plan 2013* (Tas) ('Wellington Park MP') Pt 4.2, 45; *Pitt Water Nature Reserve Management Plan 2013* (Tas) ('Pitt Water MP') 14; *Great Otway National Park and Forest Park Management Plan 2009* (Vic) ('Great Otway MP') Pt 4.1, 17; *Booderee National Park Management Plan 2011-21 (Draft)* (Cth) ('Booderee Draft MP') s 5.11.
[64] *Ngootyoong Gunditj Ngootyoong Mara South West Management Plan 2015* (Vic) ('NGNM South West MP'); Wellington Park MP provides another example of this approach; Londono et al, above n 60.

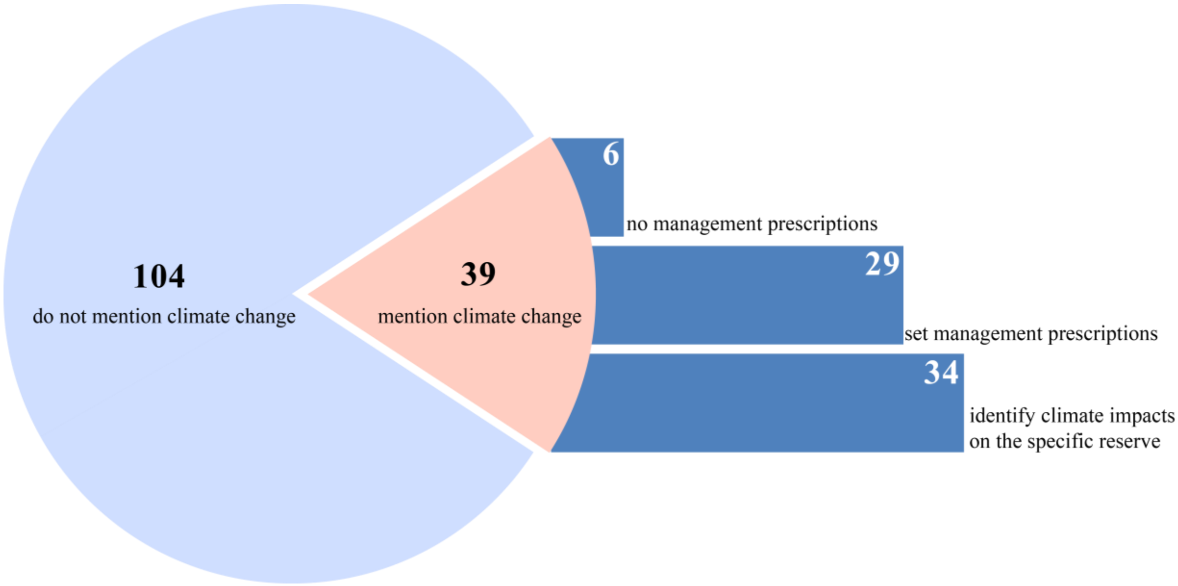

Figure 6.1 Plans that refer to the concept of climate change and set management prescriptions

Six plans only refer to climate change in descriptions of park-specific impacts, such as the draft Commonwealth Pulu Keeling management plan that sets out climate-related threats to the park but does not include any prescriptions to respond to those threats.[65] The Yarra Valley Parklands management plan does the opposite. With no detail of the specific, relevant impacts of climate change on the protected area, the Yarra Valley Parklands plan specifies one climate change goal for management: that '[f]uture management will aim to build the resilience of native species and ecosystems within the parklands to the effects of climate change'.[66]

The majority of the 29 management plans that include specific prescriptions responding to climate challenges focus on monitoring, research or communicating about climate change.[67] Prescriptions for actions to respond to climate threats include acting within park boundaries (22 plans, 55 individual prescriptions); engaging across park boundaries (10, 13); research, monitoring and communication (21, 84); and updating or initiating planning

[65] *Pulu Keeling National Park Management Plan Draft 2015-2025* (Cth) ('Pulu Keeling MP'), extracting relevant climate impacts from Hyder Consulting, above n 58; *Chiltern Mount-Pilot National Park Management Plan 2008-2018* (Vic)('Chiltern MP'); *Heathcote-Graytown National Park and Spring Creek Nature Conservation Reserve Management Plan 2008* (Vic) ('Heathcote-Graytown MP'); Lake Johnston MP; *Lake Wellington Wetlands Management Plan 2008* (Vic) ('Lake Wellington Wetlands MP'); *Port Campbell National Park and Bay of Islands Coastal Park Management Plan 1998* (Vic) ('Port Campbell MP').
[66] *Yarra Valley Parklands Management Plan 2008* (Vic) ('Yarra Valley Parklands MP') 17.
[67] Specific management prescriptions were set out in 21 plans (84 individual prescriptions in total).

processes (16, 49). Examples of management plan references and responses to the concept of climate change are set out in Table 6.1.[68]

This analysis identified progress on recognising climate change as a challenge for protected area management. There has been a clear shift in both the number of plans referring to climate change, and in the way that plans engage with the concept, across all three jurisdictions. For example, only four management plans prior to 2008 mention the concept of climate change; each with little more than a passing reference.[69] Twelve of the 70 plans in this review that are dated from 2000 to 2009 refer to climate change, but their treatment of the concept varies widely.[70] Examples range from passing references such as '[t]he impact of future climate change on the vegetation and the Wetlands is unclear',[71] through to detailed consideration of climate impacts and management responses, including to facilitate adaptation. For example, the Pitt Water Nature Reserve management plan includes a section titled 'Maintenance of habitat under climate change', discussing potential climate impacts in the reserve, and 'strategies and actions' that include engaging with neighbouring private landholders about landward retreat of coastal vegetation, out of the reserve, in response to sea level rise.[72]

Of the 20 plans in this review that date from 2010 or later,[73] almost all refer to climate change. Many of these plans include detailed descriptions of the potential impacts of climate change within the specific protected area, such as the Wellington Park and Pitt Water plans referenced in Table 6.1. These 20 plans were also more likely to set

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[68] Table 6.1 is located at the end of this chapter.
[69] That is, 4 of the 51 plans dated earlier than 2008 (0 Cth, 6 Tas, 45 Vic): Lake Johnston MP, 16; *Ben Lomond National Park Management Plan 1998* (Tas) ('Ben Lomond MP') 10; Port Campbell MP, 11; *Tasmanian Wilderness World Heritage Area Management Plan 1999* (Tas) ('TWWHA 1999') 33, stating '[a]t times, natural processes (such as erosion) and other factors (such as climate change) can also pose significant threats to natural and cultural values'; the *Tasmanian Wilderness World Heritage Area Management Plan 2016* (Tas) ('TWWHA 2016') plan was not included in the original review but, as the most recent management plan produced by Tasmania's Parks and Wildlife agency, is referenced in this chapter.
[70] The 70 plans in this review dated in that decade comprised: 2 Cth plans; 22 Tas plans; 46 Vic plans.
[71] Lake Wellington Wetlands MP, 17.
[72] Pitt Water MP, 14.
[73] The 18 plans in this review dated in that decade comprised: 6 Cth, 8 Tas, 6 Vic.

climate-related management prescriptions. Indeed, more than half of the 28 plans, in total, that set climate change prescriptions, were drafted between 2010 and 2017.[74]

There are also new forms of provisions in the most recent management plans, responding to projected climate impacts in three broad ways. First, some management plans identify particular biodiversity, locations or landforms within the planning area that are most vulnerable to climate change, enabling management to target those areas to increase their adaptive capacity and reduce vulnerabilities as the climate changes.[75] A second trend can be found in the small but growing number of plans that acknowledge that protected area managers must respond to ongoing environmental change in the planning area, including but not limited to climate change.[76] For example, the new Tasmanian Wilderness World Heritage Area ('TWWHA') management plan notes that:

> [o]ther impacts through complex and cumulative interactions across the natural environment are likely to occur and are difficult to predict. It is clear that changes will occur, and some values will be lost. There is also the potential for the development of novel ecosystems as changing climate forces species to move and geo processes to alter.[77]

Having acknowledged the inevitability of ongoing ecological change, the NGNM South West plan describes key natural values in terms of their function and diversity, rather than their component species or assemblages. For example, the plan sets the following management goal for Dry Forest and Woodlands Natural Ecosystems:

> …aim to maintain and where possible, improve the *diversity of growth stages*, maintain the *extent*, *floristic diversity* and *habitat complexity* of the Dry Forest and Woodland natural ecosystem and improve connectivity across the south-west landscape.[78]

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[74] 28 plans (of any date) set climate change prescriptions, 15 of those plans are dated 2010 or later.
[75] Eg coastal vegetation in the Pitt Water MP, 14 and wetlands in the Egg Islands MP, 17, both exposed to sea level rise; Table 6.1.
[76] Eg Wellington Park MP, 56; *Greater Alpine National Parks Draft Management Plan 2014* (Vic) ('Draft Alpine MP') 37, and in the final plan *Greater Alpine National Parks Management Plan 2016* (Vic) ('Alpine MP 2016') 31-6; Table 6.1.
[77] TWWHA 2016, 116.
[78] NGNM South West MP, 33, emphasis added; Dunlop et al, above n 25 on maintaining diversity for ecosystem goals rather than particular locations or species mixes.

A third trend in recent management plans responding to climate change is evident in efforts to identify margins and thresholds of *acceptable* levels of environmental change, with management being prioritised to avoid unacceptable levels of change.[79] While these approaches are currently far from consistent or universal, their broader adoption would be a significant step forwards for climate adaptation-oriented management planning.

6.3.2 Identifying and managing refugia

Climate refugia will be crucial to the persistence of many Australian species, communities and ecosystems as the climate changes.[80] There are 367 occurrences in 75 plans of the terms refuge, refuges, refugia or refugium.[81] However, only nine of those plans use the concept in reference to climate change. Seven of those nine plans set management prescriptions, including for *identifying* and *protecting* refugia (Figure 6.2).[82]

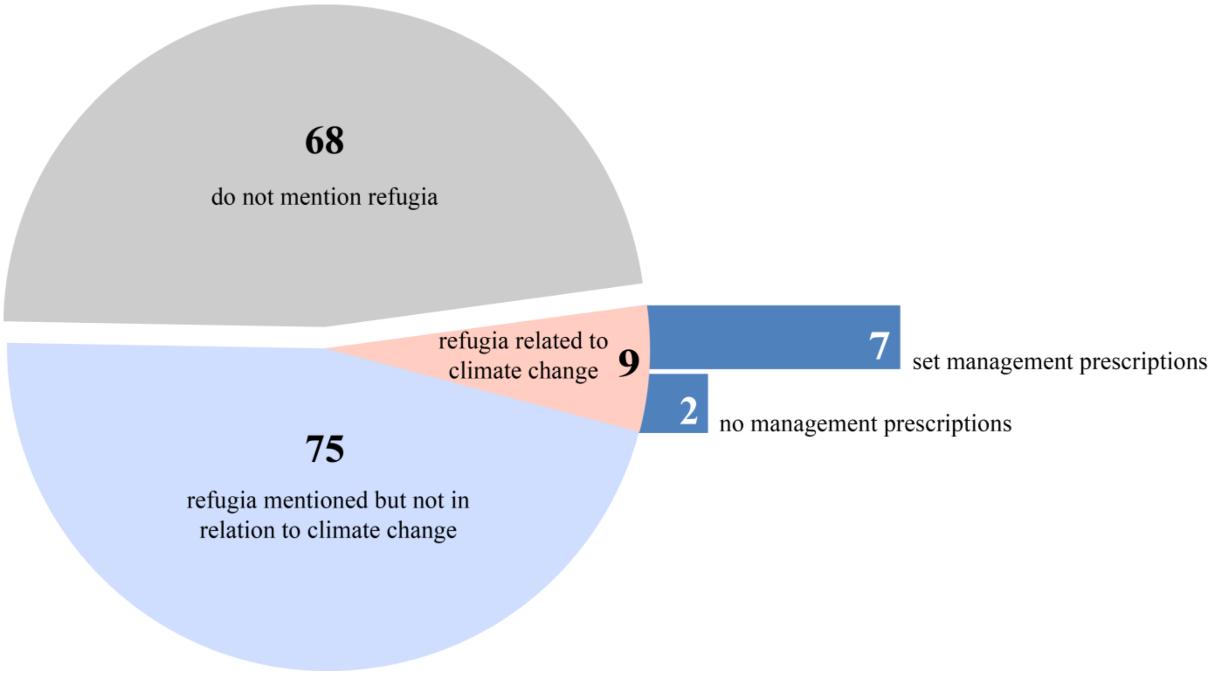

Figure 6.2 Plans that refer to the concept of refugia in the context of climate change and set prescriptions

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[79] Eg Christmas Island MP cl 4.6.4(b), 63; TWWHA 2016, 117; Table 6.1; for an excellent example of prioritising management through planning processes, see the private protected area management plan, Tasmanian Land Conservancy ('TLC'), *Big Punchbowl Reserve Management Plan 2015-2020* (TLC, 2015).
[80] Chapter 3, Section 3.3.1.
[81] The boolean search term 'refug*' was used to identify any derivatives of the term.
[82] There were five individual prescriptions each for the tasks of identifying and protecting refugia.

The plans that refer to refugia in the context of climate change are all relatively recent. The oldest plan dates from 2010,[83] with all remaining examples less than six years old.[84] Each of the three focal jurisdictions are represented, with two plans each from Tasmania and the Commonwealth, and three from Victoria.

The focus of management prescriptions for climate refugia are diverse. They include acknowledging that climate refugia exist within a particular reserve;[85] proposing to identify any climate refugia that may exist – both within and nearby a particular reserve;[86] and managing, or finding ways to appropriately manage any climate refugia that are identified.[87] For example, the Commonwealth's Kakadu national park plan recognises that identified, historical fire refuges in Kakadu's stone country will likely offer refuge to biodiversity as the climate changes,[88] while the Australian National Botanic Gardens' plan[89] seeks to ensure that its research projects on plant responses to environmental change are adopted in areas of national significance, including in 'key ecological refugia' (Table 6.1).[90]

6.3.3 Adaptive management

Adaptive management is the subject of a large and expanding body of scholarship, and is an explicit legal and policy requirement for managing public and private protected areas in the NRS.[91] Adaptive management is widely recognised as critical for making management decisions with incomplete information, and facilitating agile management of dynamic and complex social-ecological systems[92] – which means it will only become more important as the climate changes. However, empirical research has highlighted difficulties

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[83] *Devilbend Natural Features Reserve Management Plan 2010* (Vic) ('Devilbend MP').
[84] In order: *Australian National Botanic Gardens Management Plan 2012* (Cth) ('ANGB MP'); Wellington Park MP (Tas, 2013); NGNM South West MP (Vic, 2015); Alpine MP 2016 (Vic, 2016); TWWHA 2016 (Tas, 2016); and *Kakadu National Park Management Plan 2016* (Cth) ('Kakadu MP').
[85] Eg Devils Bend NP.
[86] Eg TWWHA 2016; NGNM SW MP; Wellington Park MP.
[87] Eg Alpine MP 2016; NGNM SW MP.
[88] Kakadu MP, 60.
[89] ANBG MP, 75.
[90] Table 6.1 is at the end of this chapter.
[91] Eg EPBC Regs Sch 8, Pt 1, cl 2; NRS Strategy, above n 13; Caring for Our Country, *National Reserve System: plan of management guidelines* (nd) 9 <https://www.environment.gov.au/system/files/pages/a839d059-981d-409a-999c-853dc5637c57/files/guidemanagement.pdf> ('NRS Plan of Management Guidelines').
[92] Chapter 4, Section 4.3, Principle 3 and references therein.

implementing adaptive management in practice.[93] The results of the analysis set out in this section support that broader body of research, and demonstrate that adaptive management is not being effectively implemented in Commonwealth, Victorian and Tasmanian statutory management plans, especially in public protected areas.

In protected area management planning, adaptive management is most often represented as an ‘adaptive management cycle’ (Figure 6.3), which emphasises both the multiple ‘stages’ or components of effective adaptive management in practice, and the cyclical nature of adaptive protected area management, as understanding about management improves and environmental conditions and societal expectations change.[94] Consistent components of the cycle include:

- *scoping* – based on an understanding of the physical and institutional context of a particular protected area, including available resources (e.g. ‘understand’ and ‘define’ stages in Figure 6.3, I and III);

- *planning* – including articulating intended *outcomes* from management, not just intended actions or processes;[95] and defining measurable monitoring objectives, targets or thresholds that can be used to assess progress on those defined outcomes (e.g. ‘plan’ stages in I, II and III);

- *implementing* – both management and monitoring actions (e.g. ‘implement’ stages in I and III, and ‘do’ in II); and

- *evaluating* – particularly the extent to which implementation has achieved desired outcomes, so that opportunities for improvement can be fed into the scoping and planning component of the next cycle (e.g. ‘results’ and ‘review and report’ stages in I, ‘evaluate & learn’ in II and ‘analyse, adapt, apply’ in III).

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93 Eg Williams, BK and ED Brown, ‘Adaptive management: from more talk to real action’ (2014) 53(2) *Environ Manage* 465; McFadden, JE, TL Hiller and AJ Tyre, ‘Evaluating the efficacy of adaptive management approaches: is there a formula for success?’ (2011) 92(5) *J Environ Manage* 1354.

94 Jones, G, ‘The adaptive management system for the Tasmanian Wilderness World Heritage Area—linking management planning with effectiveness evaluation’, in Allan, C and G Stankey (eds) *Adaptive environmental management: a practitioners guide* (Springer and CSIRO Publishing, 2009) 351.

95 Jones, G, ‘Is the management plan achieving its objectives?’ in G Worboys, M Lockwood and T De Lacy, *Protected area management: principles and practice* (Oxford University Press, 2nd ed, 2005) 555, 556.

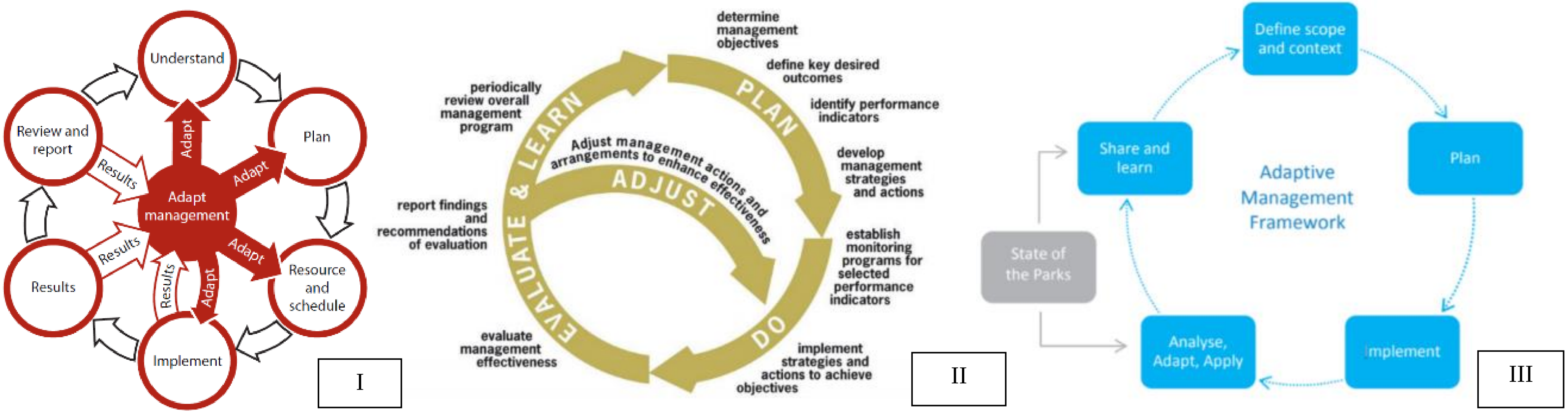

Figure 6.3 Representations of the adaptive management cycle in Commonwealth plans (I),[1] Tasmanian plans (II)[2] and Victorian plans (III)[3]

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[1] Parks Australia's 'Management Effectiveness Framework', eg Kakadu MP, 147.
[2] Tasmanian Department of Primary Industries, Parks, Water and the Environment's adaptive management cycle, eg TWWHA 2016, 186.
[3] Department of Environment, Land, Water and Planning's Adaptive Management Framework, eg NGNM South West MP, 13.

Each of the components of the adaptive management cycle is necessary to operationalise adaptive management effectively. Failing to 'complete the cycle' in practice, that is, failing to address one or more of these components, reduces accountability and can undermine management effectiveness and improvement in management outcomes over time.

The term 'adaptive management' was used in 34 of the 143 plans analysed for this research. While the process of adapting protected area management over time does not require the explicit use of this term, given its prevalence in the literature and the near-universal agreement that it is important for environmental adaptation, the term was used as a filtering device for this part of the analysis.[1] The analysis then focused on plans that both mentioned the term adaptive management and also fell within the results of the 'climate change' search, detailed above, having set prescriptions to address an identified climate change challenge within the boundaries of the protected area. Eighteen plans fit those criteria (Figure 6.4).[2]

As with climate change more generally, engagement with the concept of adaptive management varied across the management plans reviewed here, from passing references to the term through to explicit and detailed discussion of the importance of the concept. For example, the Norfolk Island management plan states only that '[c]ertain aspects of the Park and Botanic Garden may require adaptive management'.[3] Conversely, the recently updated Kakadu National Park management plan acknowledges that adaptive management is crucial to management effectiveness and legitimacy, and includes detailed diagrams

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[1] As discussed above, it is appropriate to filter plans using the term 'adaptive management' because the concept is identified as a necessary component of management in various policy instruments in Australia, and is widely accepted as a crucial characteristic of adaptation-oriented management under climate change.
[2] Alpine MP 2016; ANBG MP; Booderee Draft MP; *Christmas Island National Park Management Plan 2014* (Cth) ('Christmas Island MP'); *Coningham Nature Recreation Area Management Statement 2009* (Tas) ('Coningham MS'); Devilbend MP; Great Otway MP; Kakadu MP; *Kara Kara National Park Management Plan 2013* (Vic) ('Kara Kara MP'); *Kooyoora State Park Management Plan 2010* (Vic) ('Kooyoora MP'); *Murphys Flat Conservation Area Management Statement 2010* (Tas) ('Murphys Flat MS'); NGNM South West MP; *Norfolk Island National Park and Norfolk Botanic Garden Management Plan 2008* (Cth) ('Norfolk Island MP'); Pitt Water MP; TWWHA 2016; *Uluṟu-Kata Tjuṯa National Park Management Plan 2010-2020* (Cth) ('Uluṟu MP'); Wellington Park MP; *Woodvine Nature Reserve Management Statement 2010* ('Woodvine MS').
[3] Norfolk Island MP, 28, the only other reference to the concept in that plan is the following policy: 'Increase knowledge and adapt management responses for adverse impacts from animals, plants and pathogens', at 25.

linking overarching management plan objectives, with the intended outcomes from management, proposed management actions, and other relevant strategies and protocols.[4]

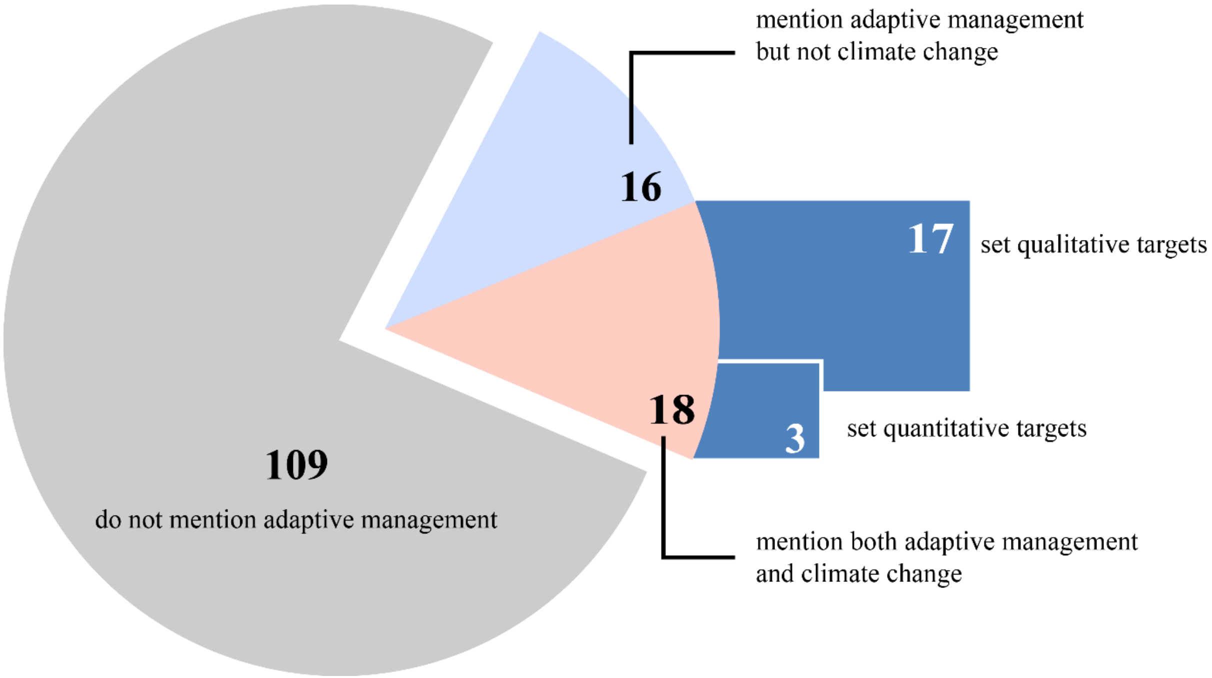

Figure 6.4 Plans that refer to adaptive management in the context of climate change and set prescriptions

Drawing on the approach taken by Meretsky and Fischman in similar research on management plans for Wildlife Refuges in the United States, this part of the review looked for efforts to implement adaptive management approaches through the use of prescriptions about:

- monitoring;
- identifying monitoring targets or thresholds to trigger management action; and
- identifying specific actions that will be triggered when thresholds are reached.[5]

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[4] Kakadu MP, 17.
[5] Meretsky and Fischman, above n 4, also considered a fourth characteristic: whether monitoring targets were qualitative or quantitative, where '[q]ualitative targets included such terms as *increase*, *decrease*, and *maintain*. Quantitative targets included such terms as *increase by 5%, double,* and *maintain densities at or below 2 bears per square mile*. If both qualitative and quantitative targets were used, quantitative targets were coded', at 1417. Jones, above n 94.

Of the 18 management plans that identified climate change as a challenge within the protected area and also used the term 'adaptive management', all included prescriptions to undertake monitoring. The subject of monitoring varied among the plans but included features such as visitor numbers and their effects, abundance and persistence of native flora and fauna populations, the effect of prescribed burns and wild fire, and the presence and effect of invasive species on the values of the protected area. Some plans described the need for monitoring in broad terms while others set very specific monitoring objectives. For example, the Wellington Park management plan identified five monitoring targets that the management committee deemed would be both achievable and generate the most useful information for future management.[6] The plan noted existing baseline data for some of the prioritised monitoring targets, and described how monitoring and evaluation processes will be developed for each issue over the life of the plan.[7] Others, such as the Christmas Island National Park management plan and Coningham Nature Recreation Area Management Statement, also provide detailed and explicit monitoring targets to indicate shortfalls or success in management.[8]

While almost all of the 18 plans set some form of qualitative target – such as to 'improve' or 'increase' vegetation, maintain a park's natural values, or reduce the effect of invasive species[9] – just three plans set quantitative indicators or monitoring targets for biodiversity outcomes.[10] They include the single case study of Key Performance Indicators and Key Desirable Outcomes in the Wellington Park management plan, which sets a quantitative standard for water turbidity that, if exceeded, would result in management intervention.[11] Other management targets are intended to be determined over the life of the Wellington Park plan. Examples of the different types of adaptive management prescriptions are set out in Table 6.1.

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[6] Wellington Park MP, ch 11 'monitoring, evaluation and adaptive management'.
[7] Ibid 214-215.
[8] 'Management statements' are a shorter, streamlined approach to statutory planning recently adopted in Tasmania, eg in the Coningham MS and Woodvine MS referenced above; Table 6.1 (at the end of this chapter) provides examples of the explicit targets set out in the Christmas Island MP and Coningham MS.
[9] With the exception of the Wellington Park MP.
[10] Conningham MP, Murphy's Flat MS and Wellington Park MP; this excludes quantitative triggers for non-conservation matters such as the performance indicator of 90% 'visitor satisfaction' on surveys in the ANGB MP and compliance with anti-theft signage in the Woodvine MS, for which a 'great result' is that: 'visitors are 100% compliant with signs and there is no evidence of stealing or damage to cultural items', at 44.
[11] Wellington Park MP, 216-7.

The results from this analysis also highlight a lack of connection, within management plans, between plan objectives, monitoring, and prescribed management responses. Examples from this analysis include plans that:

- identify management goals or desirable outcomes but no monitoring or management actions to achieve them;[12]
- set prescriptions for monitoring but do not identify management actions as a response to those results;[13] and plans that set management actions with no reference to the monitoring information necessary to effectively implement those actions over time;[14] and
- do not articulate a process for 'learning', that is, a process for triggering amendments to the plan or feeding monitoring results and management experience into periodic plan reviews (Table 6.1(d)).[15]

Each of these shortfalls in the expression of adaptive management can undermine learning, accountability and effective protected area management. Importantly for this research, they also limit the capacity of statutory management plans to help managers respond to rapid environmental change and facilitate climate adaptation.[16]

6.4 Challenges for facilitating adaptation-oriented management

Opportunities to facilitate biodiversity adaptation do exist, even within existing legal frameworks. Some such opportunities are evident from the discussion in Section 6.3, such

[12] Eg Murphys Flat MS, 6; Norfolk Island MP, 20.
[13] Eg Draft Alpine MP, 27, setting indicator of success for one particular measure: 'regular management reporting'; further detail is clearly intended to be provided in a subsidiary implementation plan but without access to that additional plan, transparent adaptive management on that indicator is effectively absent; Devilbend MP sets a prescription to monitor water quality with no indication of how that data will be used except to 'assess changes and improvements to the catchment', 16; Great Otway MP, 79.
[14] Eg Booderee Draft MP states: '[c]hange fishing restrictions if a negative impact of recreational fishing on ecosystem function is observed', but without monitoring, negative impacts could only be identified opportunistically, if at all; Norfolk Island MP, 20.
[15] Where there is a link made, it is most often in relation to weak obligations such as to 'update plans accordingly' or similar; *cf* Murphys Flat MS, Coningham MS and Woodvine MS, 'great', 'acceptable' and 'unacceptable' designations, see Section 6.5.3.
[16] Recommendations for improving adaptive management in statutory management planning are made in Section 6.5.

as examples of new provisions in Victorian, Tasmanian and Commonwealth plans for climate change, climate refugia and adaptive management. Some management plans have also begun to identify and respond to key challenges of climate change, such as responding to ongoing environmental change, and the need to articulate acceptable and unacceptable changes for directing management priorities. Some examples of those ‘climate-ready’ provisions are set out in Table 6.1, at the end of this chapter. However, there remain significant climate adaptation challenges in legal frameworks for protected area management. This section highlights both general limitations for adaptation-oriented statutory management planning, and specific challenges that became apparent in the course of this research, through interviews and the management plan analysis described above.

The first, and most significant, limitation for facilitating adaptation through protected area management is budgetary constraints. Many stakeholders interviewed for this research referred to the abolition of Commonwealth funding for the NRS, and the divisive politics surrounding conservation funding more broadly, as substantial challenges to facilitating adaptation in NRS management.[17] However, this should not be an insurmountable challenge, because there are examples of relatively time- and cost-efficient planning methods being implemented in private and IPA management planning that could be adapted to the public protected area estate.[18]

Secondly, stakeholders consistently identified the scale of the task of complying with procedural legislative obligations as a barrier to facilitating climate adaptation.[19] That is, the effects of limited resources have been compounded by the need to meet detailed legal content and procedural obligations. Even as new protected areas are established, many existing protected areas have no management plan and many more have very old plans that are increasingly irrelevant to day-to-day management. The prohibitive costs of statutory planning processes in the context of already stretched conservation budgets have required

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[17] Along with a potentially growing lack of trust in government, eg interview #6 (advocate); #7 (government); #35 (government); #39 (advocate); Environmental Defender's Office (NSW), *Climate change and the legal framework for biodiversity protection in Australia: a legal and scientific analysis discussion paper* (2009) 66.
[18] Eg Carr, Ben et al, ‘CAPitalising on conservation knowledge: using Conservation Action Planning, Healthy Country Planning and the Open Standards in Australia’ (2017) 18(3) *Ecological Management & Restoration* 176.
[19] Eg #5 (government), #7 (government), #30 (advocate).

management trade-offs. Senior protected area management staff interviewed for this research agreed that, from a pragmatic perspective, statutory plans will probably not be prepared for most protected areas. One participant commented that:

> …we'll never have statutory management plans for all our reserve land, we just can't, it's physically impossible – we haven't got the resources and we probably haven't got the need to be honest.[20]

This demonstrates a third limitation in the legal framework for management planning: a lack of clarity about the purpose of statutory management plans. The impression gleaned from analysing interview data for this research is that legal obligations overstate the importance of statutory management plans for protected area managers. This appears to stem, at least in part, from a lack of clarity about the purpose of statutory plans or, at least, how the multiple purposes for these plans ought to be prioritised. For example, interview participants in this research described the purpose of statutory plans in different, sometimes conflicting, ways, including that management plans are:

- *a 'compact' with the community*: management plans are 'not really legal', but facilitate negotiations and purport to mark consensus about biodiversity values;[21]
- *a guide for recreation in protected areas*: management plans demonstrate to the community what they can and cannot do in an area and the reasons why;[22]
- *a standard for measuring management success*: management plans are supposed to provide a standard against which management can be assessed, to determine

[20] Interviews #35 (government), #10 (NGO), agreeing that 'statutory' or individually enforceable plans are not necessary for an effective protected area management regime.
[21] Interviews #7 (government), plans should be '…a facilitator and a protector and a marker of [community consensus]… a marker of that sort of social and political view of how we want to run things'.
[22] Interviews #27 (government), #35 (government), but noting that it is 'a bit difficult to do that at the moment because most of [the plans] are full of all sorts of information and data which really is not that useful for the community… they're just very bureaucratic sort of statements'; *cf* Kakadu MP, which includes a whole section for this exact purpose, 'What park users need to know about accessing and using the park', at 151; Wellington Park MP explaining technical terminology and processes; Booderee Draft MP clearly plays an informative and facilitative role for the park's Traditional Owners, who participate in joint management.

whether tax payers' dollars are being used efficiently and effectively to achieve real conservation outcomes;[23]

- *a tool for accountability*: management plans should specify the obligations of protected area managers in relation to particular sites so that interested members of the public can hold decision makers to account for the way that they manage protected areas as public assets;[24] and/or

- *descriptive*: management plans provide a description of the values for which a protected area was established, but play a limited role in practical management and are poorly suited to 'planning' for future management needs.[25]

Few, if any, statutory plans achieve each of these diverse purposes well. The lack of clarity about the purposes of statutory management plans indicates that the legal framework, including the plans themselves, would benefit from reform.

A fourth limitation arises from a perceived lack of flexibility in legal obligations to prepare and review statutory management plans. For example, many plans are old and no longer represent 'best practice' management, but review processes can be prohibitively time consuming and costly, especially for public protected area planning which includes, for example, broad consultation obligations.[26] Protected area management laws do not specify sanctions or remedial measures for a failure to prepare, review and amend management plans as climate changes become apparent. This failure to compel planning responses to climate change may undermine the effectiveness of planning processes. In response to this challenge, one interview participant described a protected area agency practice to initiate draft management plans but never finalise them, as a way of identifying management goals but retaining flexibility for on-site management and resource allocation.[27] If accurate, this

[23] Interviews #1 (government), #7 (government), #28 (government), #30 (advocate).
[24] Interviews #21 (advocate), #30 (advocate).
[25] Interviews #10 (NGO); #18 (research), #33 (advocate).
[26] While community engagement and consultation can play a crucial role in enhancing the legitimacy of protected area management, Lockwood, M, 'Good governance for terrestrial protected areas: a framework, principles and performance outcomes' (2010) 91(3) *Journal Environmental Management* 754, these obligations are perceived to create significant time, finance and personnel costs.
[27] Interview #15 (research), #30 (advocate).

demonstrates a substantial legal and policy failure,[28] though one that protected area agencies are seeking to overcome through administrative practice.

A fifth limitation to facilitating management adaptation is evident in Figure 6.4: only three management plans in this review provided any specific, quantitative targets against which management effectiveness can be assessed.[29] This widespread failure to set explicit, measurable standards against which management can be assessed is a challenge for improving management effectiveness generally;[30] but also has particular implications for facilitating climate adaptation. As baseline ecological conditions change, and protected area management shifts away from a focus on preservation, clear management targets and standards will be the only way to ensure accountability for climate-adapted conservation.

Even where explicit targets have been set, plans typically do not create ongoing review mechanisms other than the 5-to-10 yearly statutory review obligations. Given the age of some management plans reviewed for this research,[31] there is little evidence that these statutory review processes trigger actual changes to plans.

The effects of climate change such as greater risk of bushfires and increasing extinction from heatwaves or extended droughts will be amplified by reactive approaches to protected area management planning and a lack of strategic planning.[32] However, there remains no evidence of, for example, 'adaptation pathway'-type approaches to guide management in responding to specific ecological, climatic or temporal thresholds. This is likely to become an increasingly significant limitation over coming decades.

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[28] Purposeful non-implementation and non-enforcement has been identified in the literature as a potential tool for achieving practical flexibility despite inflexible regulatory frameworks, Arnold, CA and L Gunderson, 'Adaptive Law and Resilience' (2013) 43 *Environmental Law Reporter* 10426, 10436.
[29] One of these three plans only provides one quantitative target in a case study – an example of how planning may be undertaken in future iterations of the plan – but not part of, for example, a comprehensive effort to measure and respond to change over time.
[30] IUCN, *Evaluating effectiveness: a framework for assessing management effectiveness of protected areas* (2nd edition, 2000) vii.
[31] Including 50 plans that are 20 years old or more, 10 of which have been reviewed during that time but re-issued with almost no change, Appendix 4.
[32] Eg Lockwood, above n 39, 293.

6.5 Recommendations: new approaches and mechanisms for adaptation-oriented management laws

The effects of rapid climate change on biodiversity within and around Australia's NRS have received too little attention in management planning, to date.[33] There is some indication of this changing, but the transition to climate adaptation-oriented management planning must be rapidly increased. Protected area laws and policies will require broad reform to mandate attention to climate change and to facilitate biodiversity adaptation. This section does not focus on the most effective way to conduct management planning, more generally.[34] Rather the recommendations below focus on improving statutory management planning for climate adaptation. This section begins by considering the adaptation strategy of increasing appropriate connectivity as a fundamental focus for improving adaptation in protected area management. As in Chapter 5, the remainder of the recommendations apply the three design principles introduced in Chapter 4: adopting proactive approaches to statutory protected area management plans; promoting accountable flexibility; and prioritising adaptive management through protected area law and policy.

6.5.1 Promote appropriate landscape-scale connectivity

As Chapter 3 has shown, climate-driven species redistribution will be one of the most significant climate challenges for protected area laws in Australia.[35] Species' movements will not be determined by land tenure boundaries[36] and, as a result, the strategy of expanding and enhancing the NRS must be integrated with more effective conservation of biodiversity located outside the NRS.[37]

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[33] EDO NSW, above n 17, 29; Dunlop et al, above n 57, 34-8.
[34] This is the subject of a large body of literature, eg Lockwood, above n 39; Lockwood M, G Worboys, A Kothari (eds) *Managing protected areas: a global guide* (Earthscan, 2006).
[35] Cahill, Abigail E et al, 'How does climate change cause extinction?' (2013) 280(1750) *Proceedings of the Royal Society B: Biological Sciences* 1; Bonebrake, Timothy C et al, 'Managing consequences of climate-driven species redistribution requires integration of ecology, conservation and social science' (2017) 93(1) *Biological Reviews* 284; Preston, Hon. Justice Brian J, 'Adapting to the impacts of climate change: the limits and opportunities of law in conserving biodiversity' (2013) 30 *Environmental and Planning Law Journal* 375, 387 and references cited therein.
[36] Bonebrake et al, above n 35.
[37] McCormack, Phillipa C. and Jan McDonald, 'Adaptation strategies for biodiversity conservation: has Australian law got what it takes?' (2014) 31 *Environmental and Planning Law Journal* 114, 124; House of Representatives Standing Committee on Climate Change, Environment and the Arts, Parliament of Australia,

As climate change continues to affect biodiversity within and outside of protected areas, managing a protected area separate from its surrounding context – as an 'island' of biodiversity in often fragmented or degraded landscapes, will become less and less effective. Plans are often not integrated with surrounding land use planning, even those directed by government agencies such as 'landscape-scale catchment plans, NRM strategic plans, [strategic or] bioregional plans and recovery plans for threatened species and communities'.[38] The NRS Strategy emphasises the importance of looking 'beyond the borders of protected areas' for managing climate impacts, including by working with 'managers of private land and other public natural resources, integrating the NRS with other habitat protection schemes to maintain ecological processes across the landscape'.[39]

A small number of plans have begun to take a broader approach, which in some cases has been driven by chronic under-resourcing for compliance with statutory management planning obligations.[40] For example, recent landscape-scale plans, particularly in Victoria, have integrated management across multiple protected areas to maximise the efficient use of sporadic, short-term and limited planning resources.[41] This approach has the potential to create a range of benefits for both landscape connectivity and adaptation-oriented management in those protected areas, including by improving the consistency of management priorities across ecologically similar areas.

Landscape-scale plans can also acknowledge ecological interactions between different ecosystem-types, and their interdependence, promoting landscape connectivity while also potentially creating greater flexibility for site-scale management. To achieve some of these benefits, the NGNM South West plan is structured around ecosystem types, rather than individual areas, to provide 'land managers with a realistic and prioritised basis for implementing operational programs with a clear purpose for each of the natural

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Managing Australia's biodiversity in a changing climate: the way forward (2013); Dunlop et al, above n 57, 50-1.

[38] Taylor, Martin FJ, James A Fitzsimons and Paul S Sattler, *Building nature's safety net 2014: a decade of protected area achievements in Australia* (WWF-Australia, 2014) 74; *cf* Great Otway MP, 9.

[39] NRS Strategy, above n 13, 15; Watson, JE et al, 'The performance and potential of protected areas' (2014) 515(7525) *Nature* 67, 71.

[40] Eg interview #6 (advocate), #7 (government), #30 (advocate) *cf* #3 (government).

[41] Interview #7 (government).

ecosystems' in the planning area.[42] Public protected areas in the NGNM South West planning area are also intended to be guided by goals and strategies set at the landscape scale, 'across multiple parks for ecosystems, natural assets and their threats'.[43]

A cautionary note for this kind of landscape-scale planning, is that these plans do not necessarily provide an appropriate scale to set measurable, site specific objectives to support 'completing the adaptive cycle'. One response has been to provide for subsidiary implementation plans, for example:

> [an] Implementation Plan will outline the specific tasks required over a five year period to achieve the management plan's vision and goals and implement the plan's strategies for the planning area. The implementation plan is the basis for annual [work plans] for the parks… Over the life of the plan, changes to management will be reflected in the Implementation Plan.[44]

While non-statutory implementation plans may improve both the specificity and flexibility of measurable objectives – if the proposed plan is produced – subsidiary plans have no legal status and are not required to be made public, so they can impede accountability by non-government stakeholders such as community groups.[45] This concern was put to management agencies in research interviews. One interview participant noted that existing plans have not provided measurable objectives in any case. They suggested that cheaper, faster and more relevant subsidiary implementation plans for directing action at the site scale may hold greater promise for achieving actual adaptation and conservation outcomes.[46] As discussed elsewhere,[47] a statutory obligation to design, implement and publish specific, measurable, achievable, realistic and time-bound ('SMART') objectives for managing public protected areas could help to overcome these concerns. Such a

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[42] NGNM SW MP, '[e]nvironmental management will be guided by setting goals and strategies [across the planning area] for natural ecosystems through a risk assessment and prioritisation process', at vii.
[43] NGNM SW MP, 3, 4; the measures set out at page 85 of the statutory management plan will be linked to measurable targets in the five-yearly implementation plans to 'assist in adaptive management', at 84, viii.
[44] Draft Alpine MP, interestingly, the concept of an implementation plan was removed from the final iteration of this plan, Alpine MP 2016.
[45] Interviews #30 (advocate), #39 (advocate) *cf* #7 (government).
[46] Interview #1 (government), supported by #7 (government); and can be measured against agreed, statutory landscape-scale targets to ensure that it complies with the statutory component of the planning system.
[47] Chapter 4; Section 4.2.2.

statutory obligation would not need to be implemented through a statutory plan because the obligation would, itself, be enforceable.[48]

Preparing grouped, landscape-scale plans for multiple protected areas could also advance a more holistic and connectivity-oriented approach to management planning. Some protected area statutes, such as Tasmania's *National Parks and Reserves Management Act 2002*, already allow management plans to cover multiple areas. To use this grouping mechanism, the Tasmanian government agency must demonstrate that a broader approach to management would help to address common issues and threats across the proposed planning area.[49] Similarities in climate adaptation issues and climate threats to biodiversity should meet this threshold in most cases.

In Victoria, where the statute does not exclude the possibility, grouped plans have been implemented in practice. There are at least 120 national parks, and thousands of protected areas in other categories in Victoria, that do not currently have a management plan. As in other states and territories, resourcing has been inconsistent and has not been sufficient to keep up with statutory management plan drafting and reviewing obligations.[50] In response to these challenges, Parks Victoria has initiated a regional, multi-park planning process. The agency completed its first overarching management plan in collaboration with Traditional Owners in 2015 – the NGNM South West plan.[51] The second plan, for the Greater Alpine National Parks, was finalised in 2016; and more regional plans are expected to follow.[52]

This landscape-scale approach can reduce the costs associated with individual protected area planning and dramatically increase the coverage of statutory plans. Regional plans can also facilitate management of broad, regional or global threats to the protected area estate

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[48] That is, a management agency could meet a statutory obligation to implement SMART objectives through a non-statutory implementation plan, and integrate management with broader, landscape-scale management goals contained in a statutory multi-park management plan.
[49] *National Parks and Reserves Management Act 2002* (Tas) s 19(3).
[50] interview #7 (government); with further restrictions and funding impediments at the point of implementation, Australian and New Zealand Environmental Conservation Council ('ANZECC'), *Best practice in protected area management planning* (Report of the working group on national parks and protected areas management benchmarking and best practice program, 2000) 16.
[51] The NGNM South West planning area covers more than 130 individual parks and reserves in south west Victoria, including public and Indigenous protected areas and Crown Land, NGNM SW MP, vii.
[52] 16 similar landscapes have been identified across Victoria for future plans, interview #7 (government).

by identifying ‘management problems and solutions that extend beyond [an individual] protected area’,[53] including for cross-tenure ecological interactions and connectivity.[54] In addition, managing multiple protected areas as a group creates the possibility of intentional, ‘protective’ isolation for some ecosystems, where facilitating biodiversity adaptation requires that an ecosystem be isolated from new stressors such as invasive species.[55]

‘Good neighbour’ protected area programs provide a preliminary step towards improving connectivity across the boundaries of individual protected areas, and facilitating proactive management of neighbouring properties to improve adaptation outcomes. For example, in 2017 the Tasmanian Government finalised its *Good Neighbour Charter* (‘Charter’), in collaboration with diverse groups such as the Tasmanian Farmers and Graziers Association, the Tasmanian Fire Service and the Local Government Association of Tasmania.[56] The Charter provides a framework for ‘constructive and co-operative dialogue between DPIPWE and its many adjacent landholders… [including to] assist resolution of differences if they arise’.[57] It identifies a range of cross-boundary issues for managing public land, including stray stock, invasive species and fire management, and outlines the Tasmanian government’s approach to managing those issues, both on and off-reserve.[58]

Parks Victoria’s *Good Neighbour Program* provides prioritised funding and community engagement with a focus on invasive species control, to benefit biodiversity in protected areas and for neighbouring land uses, such as agriculture.[59] Additional, regional ‘good

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[53] NGNM SW MP, vii; that plan also reduces management emphasis on the common conservation dichotomy of preserving native species and managing or eradicating non-native species in the planning area, defining pest plant and animal control as including ‘native animal control’, at viii; a less dramatic shift is evident in other jurisdictions, such as the latest Uluṟu MP which introduces a focus on ecological health and function, proposing to: ‘[i]dentify methods to monitor the health of ecosystems on a landscape scale… [and] [d]evelop monitoring programs …us[ing] results to ensure a whole of ecosystem approach to management’, at [5.6.21].
[54] Eg the plan notes that ‘the current boundary of Discovery Bay Marine NP excludes intertidal and sub-tidal reefs. Strategies within the plan will assist protection of these high conservation value areas’, at vii.
[55] Chapter 5, Section 5.4.1.
[56] Tasmanian Department of Primary Industries, Parks, Water and the Environment (‘DPIPWE’), ‘Good Neighbour Charter’ (2017) <http://dpipwe.tas.gov.au/about-the-department/good-neighbour-charter>.
[57] Ibid 5.
[58] Ibid.
[59] Dennis, Leigh C, ‘Weed control on the public-private land interface in Victoria – the “Good Neighbour Program”’, in Jacob H Spafford, J Dodd and JH Moore (eds) *Proceedings of the Thirteenth Australian Weeds Conference* (Plant Protection Society of WA, 2002) 689-92; Parks Victoria, *Annual Report 2012-2013* (Victorian Government, 2013) 12.

neighbour' programs in Victoria also include Parks Victoria's 'Protecting the Best' collaboration with the East Gippsland Catchment Management Authority, focusing on priority weeds threatening high-value biodiversity and other land uses in the Victorian highlands.[60] Pro-forma 'good neighbour' provisions were represented in the majority of plans analysed for this research, in terms similar to the following:

> Encourage neighbouring land managers, community groups, and agencies to complement park management by conserving and restoring links between remaining areas of native vegetation...[61]

> Encourage neighbouring developments and activities to have minimal adverse impact on landscape values.[62]

However, enhancing the management of protected areas for biodiversity adaptation will require more than simply 'engaging' with landholders on adjacent sites. While good neighbour programs may help public land managers to tackle biodiversity stressors that cross into protected areas from off-reserve and vice versa,[63] they provide no support for private protected area managers, who must also manage the effects of cross-border biodiversity threats. Good neighbour programs are also insufficient to define how and when a protected area manager should facilitate connectivity, or maintain isolation, between protected areas and surrounding landscapes. Clearer guidance and transparent decision-making standards are needed to help managers make decisions with inevitable trade-offs, including between the connectivity needs of different species within a single ecosystem.

As proposed in Chapter 5, connectivity risk assessment tools should be developed to anticipate the risks of connecting previously fragmented habitat as the climate changes, including from species redistributions and bushfire. Such tools could be used in protected area management to highlight incompatible land uses on land adjacent to or upstream of a

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[60] And the 'From the Highlands Down' initiative, Alpine MP 2016, vii, 15.
[61] Kooyoora MP, 16.
[62] Great Otway MP, 18.
[63] Some plans already demonstrate efforts to broaden cooperative approaches, eg Great Otway MP states that '[i]n cooperation with relevant agencies and adjacent land managers, and in accordance with a landscape-scale prioritised risk based planning, [Parks Victoria will] lead on- park or support off-park, sustainable projects that protect, enhance quality and restore or connect remnant vegetation across the landscape…', at 18.

protected area for climate adaptation. That information could then be used to support community advocacy, prioritised private conservation incentives, and agency negotiations with neighbouring landholders.

The recommendations in this section generally focus on addressing legal and policy shortfalls for facilitating appropriate connectivity across landscapes. A challenge of a different nature arises when areas are explicitly excluded from the operation of a statutory management plan, despite being located wholly within a protected area. For example, conservation areas in Tasmania vested in a statutory authority can only be made subject to a statutory management plan if the authority consents.[64] In the TWWHA, Hydro Tasmania has exercised its right to withhold consent and, as a result, some Hydro sites such as Lake Mackenzie and Lake Augusta are excluded from the operation of the new TWWHA management plan 2016.[65] Given the size of the TWWHA, excluding these particular areas may, or may not, be significant for broader management goals. However, excluded sites that are the origin of significant weed infestations into protected areas, the site of critical climate refugia, or the subject of drastically different fire management, for example, may create challenges for enhancing connectivity and broader adaptation-oriented management in future.

A comprehensive legislative or policy approach to continental connectivity promises a more effective response to the effects of physical and regulatory fragmentation on biodiversity than the current, piecemeal approach. However, in Australia, such a response would need to be developed by state and Commonwealth governments in collaboration with the private sector, and would need to overcome the political inertia that rendered the National Wildlife Corridors Plan impotent.[66]

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[64] *National Parks and Reserves Management Act 2002* (Tas) s 19(7).
[65] TWWHA 2016, 32, although they may continue to be subject to the Strategic Management Statement, a non-statutory component of the plan that sets out management arrangements for tenures in the TWWHA not subject to the statutory management plan, at 32, 206.
[66] Department of Sustainability, Environment, Water, Population and Communities, Commonwealth Government, *National Wildlife Corridors Plan: a framework for landscape-scale conservation* (2012) <http://155.187.2.69/biodiversity/wildlife-corridors/publications/pubs/national-wildlife-corridors-plan.pdf>; Chapter 3, Section 3.3.2.

6.5.2 Take a more proactive approach to management planning

Adaptation-oriented management planning would benefit from a more proactive approach in law and policy. The 'proactivity' design principle introduced in Chapter 4 focuses on improving legal responsiveness, and shifting law and policy from reactive and *ad hoc* to proactive conservation approaches.[67] Explicitly identifying climate risks to biodiversity is a prerequisite for improving the adaptiveness and proactivity of management planning obligations.[68] All statutory management plans – national or state, landscape or site-specific – should acknowledge the projected effects of climate change for the specific planning area.[69] Management plans must be drafted to reflect a presumption that nature is dynamic and that climate change will inevitably accelerate ecological change in protected areas.[70] In doing so, management plans could acknowledge the increasing complexity of conservation management under climate change,[71] and the inevitability of losing some existing biodiversity values, and gaining new values in the planning area.[72]

The next step in improving the proactive orientation of laws and policies is to ensure that they also prioritise key adaptation characteristics such as climate refugia and environmental 'improvement' through ecological and adaptation-oriented restoration.[73] The remainder of this section investigates potential law reform to prioritise these characteristics.

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[67] Trouwborst, Arie, 'International nature conservation law and the adaptation of biodiversity to climate change' (2009) 21 *Journal of Environmental Law* 419, 424; Schramm, Daniel and Akiva Fishman, 'Legal frameworks for adaptive natural resource management in a changing climate' (2010) 22 *The Georgetown International Environmental Law Review* 491, 501; Stein, BA et al (eds), *Climate-smart conservation: putting adaptation principles into practice* (National Wildlife Federation, 2014); Stein, Bruce A et al, 'Preparing for and managing change: climate adaptation for biodiversity and ecosystems' (2013) 11(9) *Frontiers in Ecology and the Environment* 502, 505-6.

[68] The Conservation Measures Partnership, *Open Standards for the Practice of Conservation Version 3.0* (April 2013) <http://cmp-openstandards.org/> (hereafter, 'Open Standards') 8; Stein et al 2013, above n 67.

[69] Stein et al 2013, above n 67.

[70] Dunlop et al, above n 57, 21-22; Sieck, M et al, 'Current models broadly neglect specific needs of biodiversity conservation in protected areas under climate change' (2011) 11 *BMC Ecol* 12.

[71] Game, Edward T et al, 'Conservation in a wicked complex world; challenges and solutions' (2014) 7(3) *Conservation Letters* 271.

[72] Dunlop et al, above n 57, 50-2.

[73] Chapter 4, Section 4.3 sets out the characteristics of the 'proactive' design principle, including environmental restoration and 'gains', represented in some statutory objects clauses as protecting, conserving and *enhancing* biodiversity.

(a) Proactively identify and manage climate refugia

Climate refugia played a critical role in the survival and evolution of biodiversity during the last ice age.[74] Many areas of historical refuge for biodiversity remain relatively ecologically and climatically stable, with the potential to shield biodiversity from the most transformative effects of climate change, at least in the short term.[75] The concept of refugia has been highlighted in adaptation literature for its potential to focus management and resourcing on these relatively stable areas.[76] Proactively managing refugia can improve opportunities for species to adapt *in situ* as well as supporting high quality habitat into which species can redistribute from surrounding landscapes as the climate changes.[77] The most significant areas that are predicted to provide climate refugia in Australia are located predominantly in the south east and far south west of the continent.[78] Many of these areas are currently subject to substantial human modification, so active management to improve habitat condition and extent, and 'facilitate species movement and persistence in these areas' will be critical as the climate changes.[79]

Some statutory management plans do mention, and seek to conserve climate refugia for adaptation, including the latest TWWHA management plan, which states:

> Where possible and practical, implement strategies and actions to protect values threatened by climate change; such as, the identification of terrestrial and aquatic refugia that strengthen ecosystem resilience and support adaptation…[80]

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[74] Ashcroft, Michael B, 'Identifying refugia from climate change' (2010) 37 *Journal of Biogeography* 1407.
[75] Morelli, TL et al, 'Managing climate change refugia for climate adaptation' (2016) 11(8) *PLoS ONE* e0159909.
[76] Reside, April E. et al, *Climate change refugia for terrestrial biodiversity: defining areas that promote species persistence and ecosystem resilience in the face of global climate change* (National Climate Change Adaptation Research Facility, 2013); climate refugia will almost certainly not offer habitat in perpetuity, as the level of change already locked into the climate system may overwhelm even the most resilient environments, Morelli et al, above n 75.
[77] Thomas, CD et al, 'Protected areas facilitate species' range expansions' (2012) 109(35) *Proceedings of the National Academy of Science U S A* 14063; Gallardo, B et al, 'Protected areas offer refuge from invasive species spreading under climate change' (2017) 23(12) *Glob Chang Biol* 5331.
[78] Reside et al, above n 76, 3.
[79] Ibid.
[80] TWWHA 2016, 117.

The draft Alpine National Parks plan in Victoria is more specific:

> Strategy: Identify and manage areas that can act as climate change refugia, including protection from recreation, weeds and pest animals and inappropriate fire regimes, such as large-scale severe bushfire.
>
> Measure: Representative areas in best condition are identified and managed as high priority for implementing strategies identified in section 4.1.1 Regular management reporting: Stable condition and extent of areas in best condition.[81]

The absence of this concept from legal requirements for protected area management, remains a deficiency in protected area management laws.[82] However, references to historical or current refugia in the 75 plans analysed for this research that did *not* acknowledge climate change, could be readily amended to note the future potential of these areas for climate adaptation, such as:

> The spring is one of the few permanent sources of freshwater on Christmas Island and acts as a dry season refuge for a number of terrestrial species.[83]
>
> The rainforest located on the Savage River Plateau is the largest contiguous area of cool temperate rainforest surviving in Australia. The area is an outstanding biological resource and a major refuge in Australia for myrtle (*Nothofagus cunninghamii*) dominated rainforest, a type of forest with strong affinities to Gondwanic land flora.[84]

New provisions should also be inserted in these plans specifically requiring that those refugia be managed in a way that supports climate adaptation – that is, not necessarily preserving their historical condition, but allowing species, assemblages and communities to retreat or shift into those areas to persist as the climate changes. As a starting point, existing protective provisions for non-climatic refugia could be applied to climate refugia. For example, specific management provisions are applied in Victorian Special Protection

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[81] Draft Alpine MP, 27; the strategy identified in this quote is also in the final plan, in almost the same terms, and described as a 'highest priority strategy', Alpine MP 2016, 41; however, there does not appear to be a directly-connected measurement for this strategy in the final plan.
[82] The *Biodiversity Conservation Act 2016* (NSW) is the only conservation law in Australia that mentions the concept, Chapter 4, Section 4.2; there is a single mention in the NRS Plan of Management Guidelines, above n 91, 7; the NRS Strategy, above n 13, identifies incorporating scientific understanding of climate-related challenges, including refugia, as a priority action for improving the NRS, at 20-1.
[83] Christmas Island MP, 134.
[84] *Savage River National Park and Savage River Regional Reserve Draft Management Plan 2001*, 5.

Area overlays, which include restricting certain activities at particular times of year to avoid conflict with refuge characteristics such as species' breeding habits in spring.[85] Special Protection Area provisions can also require land managers to exclude fire – both planned, mitigation burns and unplanned bushfires – especially at particular times of year. They may also include protecting habitat characteristics, such as large old trees, hollow trees, fauna refuges and woody debris on the ground, from inappropriate land management activities including ecological fire management.[86]

Provisions for identifying and managing existing refugia are a critical first step. In future, more proactive and 'interventionist' approaches may be necessary. For example, future climate refugia may not be found in familiar, historically-referenced ecosystems and assemblages. Areas that have provided refuge to a particular species in the past may no longer be suitable as refugia for that species as the climate changes.[87] A broader focus may include recognising novel ecosystems and species assemblages, and potentially constructed or engineered habitat, as potential climate refugia.[88] Climate refugia may also need to be engineered as habitat for species unable to migrate to more suitable habitat independently, or for which suitable habitat no longer exists.

(b) Promote environmental gains through novel management interventions

Protected areas have not been immune to Australia's catastrophic biodiversity losses over the past 200 years. Some particularly well-known protected areas, such as Kakadu National Park, have been the site of major local mammal extinctions and other, long-term biodiversity declines.[89] The legal design principle of adopting more proactive conservation approaches includes a focus on promoting environmental 'gains', even as the risks of

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[85] 'Orienteering and rogaining events are permitted in the planning area, except … and subject to regulation in the Special Protection Area – Fauna Refuge during spring …', Heathcote-Graytown MP, 44.

[86] Ibid 20; Kara Kara NP, 18, including a strategy to proactively 'redistribute the stacks of woody debris along Centre Road back to the forest floor with assistance from volunteers and interested groups', at 13; Kooyoora MP, 17.

[87] This prompted one participant to argue that management planning should take a broader approach, highlighting 'those patches in the landscape that are more likely to reliably provide habitat resources to *all* species', interview #38 (research).

[88] Hobbs R, 'Grieving for the past and hoping for the future: balancing polarizing perspectives in conservation and restoration' (2013) 21(2) *Restoration Ecology* 145; no existing management plan contemplates conserving or managing such areas.

[89] Eg Woinarski J et al, 'Monitoring indicates rapid and severe decline of native small mammals in Kakadu National Park, northern Australia' (2006) *Wildlife Research* 33: 263–74.

climate-driven extinction and biodiversity loss increase. Recognising that protected area management does not always begin from a baseline of resilient and healthy biodiversity, this design principle fundamentally demands a higher legal standard for management than simply 'preventing additional harm'. Environmental gains may be pursued through adaptation-oriented restoration and, in some cases, by directing management to conserve novel assemblages and ecosystems as well as native biodiversity in protected areas.

Proactive strategies to enhance or restore protected areas may include introducing species and ecological communities outside of their historical distributions, a strategy known as 'conservation introductions'. One form of introduction, 'ecological replacement', involves introducing species or assemblages into a new environment to replace lost ecological functions.[90] In protected areas, ecological replacements could provide environmental gains where the extinction or decline of a native species has triggered change, or even transformation, to the health, ecological function and/or adaptive capacity of the protected area.

Facilitating ecological replacements will require reform to more than protected area laws and policies; an issue that is considered in more detail in Chapter 8. However, for the purposes of this chapter, protected area laws and policies can limit the use of ecological replacements for environmental 'gains' in three broad ways. First, protected area management plans typically emphasise protecting 'native' or 'indigenous' biodiversity – sometimes defined very narrowly – rather than ecological functions.[91] Second, conservation laws and management plans focus on preserving biodiversity in wild and natural conditions, where 'wildness' is typically defined by the exclusion of proactive human intervention.[92] Third, almost all of the protected area management plans analysed for this research presume that biodiversity components such as species assemblages or

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[90] IUCN/Species Survival Commission, *Guidelines for reintroductions and other conservation translocations: version 1.0* (2013) 3, including functions that were lost when a native species became extinct; see Chapter 8.
[91] Drawing on statutory definitions such as those described in Chapter 4, eg 'native' species in Tasmanian legislation applies only to species native to *Tasmania* (not Australia) while other statutes or statutory instruments limit the definition according to the year that a species 'arrived' in Australia or by the boundaries of a particular protected area.
[92] Eg *Threatened Species Protection Act 1995* (Tas) cl 3; *Flora and Fauna Gurantee Act 1988* (Vic) s 4.

ecological communities can be preserved *in situ*, in perpetuity, failing to acknowledge the certainty of climate-driven change.

In addition to addressing these implicit, ‘conservation paradigm’ hurdles, explicit statutory barriers to conservation introductions should also be reviewed to determine whether they are appropriate under climate change. For example, s 17C(1) of the *National Parks Act 1975* (Vic) prohibits, among other things, the ‘use of any non-indigenous animal’ in any Wilderness Park. Section 17C(2) lists exceptions such as non-commercial mechanical activities, measures for human health and safety and deer stalking, along with,

> (a) any road, structure or installation or any use of motorized or mechanical transport or *any use, control or destruction of non-indigenous animals* which the Secretary considers is essential for the responsible management of the park.[93]

The context of the phrase ‘non-indigenous animals’ in this provision, alongside ‘road, structure and installation’, and the term ‘use’ in the context of ‘control or destruction’, both suggest that this exception is not intended to cover conservation activities. The provision does not expressly deal with whether introducing a non-indigenous species as an ecological replacement would be considered a ‘use’ of that species, but it potentially excludes introductions to support or improve climate adaptation, except of species indigenous to a Wilderness park.[94] Some statutory management plans go further, requiring vegetation restoration activities to rely on ‘native seed stock from within the boundaries of the park’,[95] or expressly excluding certain introductions, such as:

> [The] introduction of fauna or fish (including Tasmanian fauna or fish) not historically indigenous *within the boundaries of the Park or Reserve* will not be allowed…[96]

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[93] *National Parks Act 1975* (Vic) s 17C(2).
[94] The *National Parks Act 1975* (Vic) does not define indigenous species; the term may be interpreted to mean a species indigenous to the Park, to the state of Victoria, or to Australia.
[95] Eg *Mount Field National Park, Marriotts Falls State Reserve & Junee Cave State Reserve Management Plan 2002* (Tas) (‘Mt Field MP’), ‘[w]here possible, rehabilitation programs in the park and reserves will use seed collected within the park and reserves’, at 25; *Cape Liptrap Coastal Park Management Plan 2003* (Vic), ‘Restore disturbed areas using indigenous species of local provenance’, at 10.
[96] *Freycinet National Park and Wye River State Reserve Management Plan 2000,* 39, emphasis added; McCormack, Phillipa C, ‘Conservation introductions for biodiversity adaptation under climate change’ (2018) (first view) *Transnational Environmental Law* 1.

Shifting climatic zones may trigger a need for warm-adapted seedlings from areas adjacent to protected areas to enhance adaptive capacity, particularly when local plant species struggle to recruit seedlings independently as the climate changes.[97] Maladaptive barriers should be removed, but there may be a role for high conservation value, intact and ecologically resilient areas being declared as 'no-go zones' for conservation introductions, particularly in the short term.[98] Defining when such areas should be declared could be achieved through landscape-scale management plans, essentially operating as a conservation-specific bioregional plan.[99]

6.5.3 Promote accountable flexibility in protected area management

This legal design principle promotes greater flexibility in the range of adaptive outcomes that protected area managers can pursue, while ensuring high standards of accountability for *how* decisions are made. This section proposes triage for management priorities, balanced by stronger measurement and reporting obligations for management effectiveness.

(a) Take a triage approach to management goals and actions but increase accountability for effectiveness

A triage approach to management planning would prioritise funding, effort and reporting to a limited number of desirable management outcomes and measurable actions. Triage is most effective in the context of clearly articulated overarching goals and objects clauses, because conservation managers can then define with precision both what is valued, and the

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[97] Eg Weeks AR et al, 'Assessing the benefits and risks of translocations in changing environments: a genetic perspective' (2011) 4(6) *Evol Appl* 709, 709-10; Hughes, L, 'Can Australian biodiversity adapt to climate change?' in Daniel Lunney and Pat Hutchings (eds), *Wildlife and climate change: towards robust conservation strategies for Australian fauna* (Royal Zoological Society of NSW, 2012) 8, 8; ecological restoration in practice, including by Parks Victoria, is increasingly using climate-adapted seed stock, though potentially in contravention of these ageing management plan provisions.
[98] McCormack, above n 96; S. Harris, Stephen et al, 'Whose backyard? Some precautions in choosing recipient sites for assisted colonisation of Australian plants and animals' (2013) 14(2) *Ecological Management & Restoration* 106, 107; in support of a precautionary approach in the short term, Camacho, Alejandro E, 'Assisted migration: redefining nature and natural resource law under climate change' (2010) 27(2) *Yale Journal on Regulation* 171, 236.
[99] McCormack, above n 96.

kinds of management outcomes that are desirable or will be acceptable.[100] However, even in the absence of legal reform to statutory objects, management goals and activities can still be prioritised across landscapes or within individual protected areas.

One interview participant for this research supported a triage approach in protected area management planning, suggesting that despite exhaustive management plan descriptions and statutory reporting requirements, there are only ever a limited number of elements that can actually be controlled by managers. Given the complexity of identifying and managing all of the critical values in any given area, the participant argued that management plans should be far more targeted and pragmatic, to identify those few elements that are ‘controllable’, and concentrate on them.[101]

A triage approach would require management plans to specify a small number of desirable management outcomes, such as eradicating a highly invasive weed; maintaining critical bushfire refugia; providing both current and future habitats for specified keystone species; or ensuring the persistence of an ecological community particularly vulnerable to climate change, such as coastal health.[102] Plans would then need to prioritise management activities to achieve those outcomes. Recent Tasmanian management plans demonstrate progress in this respect, explicitly prioritising a small number of actions that are both measurable and achievable, and noting the value of this approach for improving accountability and reporting on management effectiveness. When drafting a new management plan, Tasmanian planners are encouraged to consider, for example, the most important things that the plan needs to deliver; what, precisely, will be measured to document management outcomes; and what would be a great (challenging yet achievable) result for each outcome?[103] Recent plans include relevant indicators for determining success on each desirable outcome, and an example of what ‘great’, ‘acceptable’, and ‘unacceptable’ results

[100] Chapter 4, Secton 4.3; interviews #1 (government), #32 (research); Coetzee, Bernard WT, Kevin J Gaston and Steven L Chown, ‘Local scale comparisons of biodiversity as a test for global protected area ecological performance: a meta-analysis’ (2014) 9(8) *PLoS ONE* e105824.
[101] Interview #22 (government).
[102] Van Wilgen, BW and HC Biggs, ‘A critical assessment of adaptive ecosystem management in a large savanna protected area in South Africa’ (2011) 144(4) *Biological Conservation* 1179, 1180.
[103] Tasmanian Parks and Wildlife Service, *Evaluating management effectiveness: the Monitoring and Reporting System for Tasmania’s national parks and reserves* (2013) 40 <http://stors.tas.gov.au/1234092>.

would look like for assessing management performance. For an example of this approach, see Figure 6.5.

Outcome 1.	**Degraded bare earth areas have decreased and native vegetation cover is re-establishing in former degraded sites**	
Indicator	Area of bare earth exposed by unauthorised vehicles in the native grassland	Area of bare earth exposed by fire management slashing practices
Monitoring actions	In 2010: • establish reference set of monitoring sites and photo points for evaluating effectiveness of the planned closures; • photograph existing conditions. Establish folder of digital images of Coningham 2010 on PWS intranet together with details of site locations, dates, photographer etc.; • measure or estimate area of bare earth in each degraded site; and • reference sites with photo points established in 2010. Photographed annually in spring or early summer Annually: • repeat above monitoring survey in spring or early summer.	
Great result	By 2015 native grassland re-established on 85% of area of bare earth.	By 2015, native vegetation cover re-established on 85% of area of bare earth at reference sites.
Acceptable result	By 2015 native grassland re-established on 50% of area of bare earth.	By 2015 native vegetation cover re-established on 50% of area of bare earth.
Unacceptable result	By 2015 area of bare earth has increased in size.	By 2015 area of bare earth has increased in size.

Figure 6.5 Example of measurable 'indicators of success' in PWS (Tas), *Coningham Nature Recreation Area Management Statement* (2009)

The Pitt Water Nature Reserve Management Plan provides another example, setting an ambitious target of controlling of all Weeds of National Significance ('WONS') in the reserve by 2022, and replacing those weeds with native species that are appropriate for habitat. Interestingly, that plan notes that an *acceptable* result would be that 'By 2022, most existing WONS are controlled in the reserve (*except where they provide important habitat*) and no new plants are identified'.[104] In that case, flexibility for applying the management goals is built into the target, with the primary goal being appropriate, effective habitat, and the *preference* being to use native species.

To meet the second component of this design principle, a triage approach must be balanced with enhanced accountability for management outcomes. Accountability for management outcomes, in turn, will require significant improvements in monitoring and reporting

[104] Pitt Water MP, 80, emphasis added.

practices for management effectiveness.[105] Management effectiveness has traditionally been poorly understood, measured and funded in Australia.[106] Some participants in interviews for this research highlighted the political nature of management planning and reporting, suggesting that measurable actions and monitoring obligations are avoided precisely because they promote accountability, unless government agencies,

> have a specific policy intent, and then they will absolutely prescribe it in that management plan, and that may not necessarily be a conservation goal, that might be a commercial development goal…[107]

Recent trends indicate improvements in agency approaches to accountability and management effectiveness. For example, Parks Victoria is one of two Australian states that undertakes periodic 'State of the Parks' reporting, and has an agency section dedicated to improving management effectiveness.[108] Parks and Wildlife in Tasmania launched a comprehensive management effectiveness Monitoring and Reporting System in 2013 that is designed to operate across all of the state's public protected areas.[109] The Monitoring and Reporting System is being progressively implemented, as resources allow.[110] However, the statutory management plans reviewed for this research demonstrate that recent advances in management effectiveness have not been applied universally to new management plans, or at all, to older plans.[111]

As the climate changes, desirable outcomes and the management actions needed to achieve them will almost certainly also need to change. To avoid the need to update statutory

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[105] Although potentially limiting reporting obligations to the specific, prioritised management outcomes for any particular protected area; more general reporting obligations could be included where data are available, Taylor, Fitzsimons and Sattler, above n 38, 106.
[106] Ibid 74.
[107] Interview #3 (government).
[108] Parks Victoria, 'State of the Parks' <http://parkweb.vic.gov.au/park-management/environment/research-and-scientific-management/state-of-the-parks>; although a lack of direct connections between actions and measurement indicators in recent plans illustrate ongoing challenges for balancing management effectiveness and flexible planning at landscape scales.
[109] Tasmanian Parks and Wildlife Service, above n 103.
[110] Jones, G, 'What's working, what's not: the Monitoring and Reporting System for Tasmania's national parks and reserves', in Watson A et al (eds) *Science and stewardship to protect and sustain wilderness values: Tenth World Wilderness Congress symposium, Proceedings RMRS-P-74* (Salamanca, Spain, 4-10 October 2013) 77-90.
[111] NGNM South West MP and the Draft Alpine MP rely on subsidiary implementation plans to set measurable targets for management *cf* some of the most recent Tasmanian plans, which set a small number of clear and measurable targets against which effectiveness can be measured by both the agency and the public, Figure 6.5.

management plans whenever such changes are necessary, plans could specify guidelines for identifying new priorities. An example of this kind of guidance comes from the Christmas Island management plan, which was being finalised at the same time as a regional (multi-species) recovery plan was being prepared for EPBC Act listed threatened species. The management plan states that, ‘to support the recovery of EPBC listed species, this management plan needs to enable new, additional and appropriate conservation actions that may not be specifically described within this plan’.[112] The plan sets a policy for determining native plant and animal conservation priorities based on:

> (a) the conservation status, significance or biodiversity value of the target species with high priority placed on significant species […]
> (b) consideration of the *risks of taking no action*
> (c) the likelihood that proposed actions will have *ecosystem or multiple species benefits*
> (d) the likelihood that proposed actions *will achieve their conservation aims,* particularly in relation to the reduction of threatening processes and the recovery of significant species
> (e) cost benefit and effectiveness of implementing proposed actions.[113]

These are highly adaptive considerations. A similar provision could be adopted in new management plans to allow protected area managers to respond to new challenges, while still requiring them to demonstrate compliance with this kind of express guidance for prioritisation.

Some biodiversity loss will be inevitable as the climate changes. As a result, statutory management plans and triage processes may also need to provide guidance for managers on when they can defensibly argue that active intervention is no longer appropriate – a component of the triage. For example, the TWWHA plan notes that ‘[i]n some cases, proper recording of destroyed, damaged or at-risk sites may be the management priority if more active intervention is not appropriate…’.[114]. Similarly, complete loss of a coastal or island wetland system to sea level rise may mean that active intervention is futile,[115] while in other cases, active intervention may be possible, but expensive, difficult and potentially

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[112] Christmas Island MP, 53.
[113] Ibid, emphasis added.
[114] TWWHA 2016, 99.
[115] Egg Island MP, 5, 17.

controversial.[116] Statutory or policy guidance to support rapid, transparent decision making in such cases would be valuable, and could take the form of statutory decision-making criteria, such as those described in Chapter 4.[117]

One way to set decision-making criteria for triaging management goals and actions – and, specifically, to improve accountability around decisions not to conserve a particular component of biodiversity – may be through 'nested' processes, such as Tasmania's overarching *Reserve Management Code of Practice* ('Code of Practice').[118] The Code of Practice 'specifies appropriate standards and practices for new activities in reserves… [and] provides best practice operational standards' for conservation management.[119] One of the primary benefits of this approach is the relative ease of amending an overarching code, with the trickle-down benefits of any adaptation-oriented reforms applying immediately to all regional and site-specific plans. The alternative – amending hundreds of individual statutory management plans – is far too costly and time consuming to be efficient. It would also, arguably, divert limited management funding from activities that are likely to have more practical adaptation and conservation benefits to biodiversity than generic updates to long-outdated statutory plans.

6.5.4 Prioritise adaptive management in protected areas

Protected area management agencies in Australia have made explicit commitments, particularly in newer statutory plans, to adaptive management approaches.[120] Nevertheless, Section 6.3 identifies common shortfalls for adaptive management in existing plans, especially for connecting the different stages of the adaptive management cycle. For

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[116] Eg Bassett, Owen D et al, 'Aerial sowing stopped the loss of alpine ash (Eucalyptus delegatensis) forests burnt by three short-interval fires in the Alpine National Park, Victoria, Australia' (2015) 342 *Forest Ecology and Management* 39.
[117] Section 4.3.
[118] Tasmanian Parks and Wildlife Service, *Tasmanian Reserve Management Code of Practice 2003* <http://www.parks.tas.gov.au/index.aspx?base=7154>; the Code of Practice provides guidance on all forms of conservation practice and environmental decision making in all of Tasmania's public reserves.
[119] Woodvine MS, 5; these general management principles from the Code of Practice have been directly adopted into some protected area management statements, such as the Woodvine MS, 5.
[120] Section 6.3; eg Tasmania's Parks and Wildlife Service 'is committed to a system of adaptive management', Woodvine MS, 32; Parks Victoria, 'Science and adaptive management' <https://parkweb.vic.gov.au/park-management/environment/research-and-scientific-management>; Commonwealth Director of National Parks, *Climate change strategic overview 2009-2014* (Parks Australia, 2009) 3.

example, many plans failed to connect desirable management outcomes with specific management actions, and actions with appropriate monitoring tasks. Similarly, monitoring prescriptions rarely defined thresholds or triggers for remedial management action, or explained how new information might trigger or feed into periodic management plan reviews.[121] Failing to connect these stages of the adaptive management cycle limits the benefits of adaptive management for promoting learning and adaptation-oriented management planning.

As a starting point, management plans must express clear, outcome-focussed goals for managing biodiversity as the climate changes. These goals must flow from 'climate-ready' overarching statutory goals and objects clauses.[122] Each strategy or action specified in a management plan must then be targeted to deliver those outcomes. Similarly, monitoring obligations must be able to produce information that demonstrates whether management actions are helping to achieve the plan's goals. Monitoring results must also be able to feed back into revised management planning and practice, to improve the likelihood of achieving desirable management outcomes.[123] A useful way to achieve this feedback loop, which is all but absent from the management plans reviewed for this research, is to ensure that plans include triggers and response mechanisms. That is, management actions that will be implemented in response to defined thresholds being reached, and observed through monitoring.

To address the common shortfalls identified in statutory management plans analysed in this research, the remainder of this section proposes two stages of reform. The first stage is to improve existing legal obligations to undertake periodic, 'whole-of-plan' reviews. The second stage is to design and implement legal mechanisms to trigger management revisions during the life of a plan.

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[121] Section 6.3 and Table 6.1, below.
[122] As a part of the 'scoping' step in the adaptive management cycle (Section 6.3), to ensure that the specific climate related characteristics and threats to the protected area are at the centre of the planning process, Stein et al 2013, above n 67; McDonald et al, above n 25; Dunlop et al, above n 25.
[123] Adaptive management cycle (Section 6.3); with a subsidiary task being to ensure that the management plan identifies who is responsible for implementation.

(a) Statutory obligations to periodically review and amend management plans

Legislation in many Australian jurisdictions already imposes statutory obligations to review management plans setting, for example, ten year deadlines for reviewing plans.[124] These provisions create a mechanism for updating management objectives and modifying management actions as climatic, ecological and social contexts change, at least in theory.[125] Review provisions also have the potential to improve accountability for incorporating new information into protected area plans. However, as noted above, management plans have not been prepared at all for many protected areas. With the exception of Commonwealth protected areas, many plans that do exist have not been reviewed, within statutory timeframes, if at all.[126]

Enforceable periodic review provisions could be used to ensure that protected area management plans and agencies ‘complete the adaptive management cycle’. This approach would benefit from third party standing rights, to enable interested groups and individuals to lobby, advocate and if necessary, litigate to ensure compliance.[127] Statutory review provisions could also be improved with a requirement that management plans must *always* be updated or revised following a review, unless the agency can demonstrate that updating the plan is not necessary.

Clearly, to be implemented effectively, this form of review obligation would require a dramatic increase in public funding, and would not apply to protected areas without an existing management plan. A more practical, efficient and, arguably, more meaningful reform – in terms of achieving real change – could be to implement, in each jurisdiction, an overarching code of management for protected areas, similar to the Tasmanian Code of Practice.[128] A statutory obligation could be introduced to review and update the Code of Practice every five to ten years, or more often as necessary, rather than review obligations

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[124] Section 6.2.
[125] McCormack and McDonald, above n 37; particularly because legislative objects – that guide management in the absence of a management plan – cannot be updated as readily or respond to local and regional drivers in the way that a management plan can.
[126] McCormack and McDonald, above n 37.
[127] Eg Hawke, Allan, *The Australian Environment Act: report of the independent review of the Environment Protection and Biodiversity Conservation Act 1999* (Report to the Commonwealth Department of the Environment, Water, Heritage and the Arts, 2009) 261.
[128] Tasmanian Parks and Wildlife Service, above n 118.

for each individual plan. Consultation should be required, from groups such as private and public protected area managers, scientific experts and the wider, non-expert community.

Updates to the Code of Practice could then be automatically integrated into individual and regional statutory management planning processes, and applied to all areas without a plan. That way, day-to-day management, reporting and accountability processes for each area could be assessed in terms of both the Code and any existing statutory plan. In this way, climate adaptation imperatives such as identifying and managing climate refugia, could be integrated, periodically, into conservation management priorities across the entire public protected area estate.

(b) Adapt management responses over time – revisions within the life of a plan

The analysis of management plans set out in Section 6.3 did not identify any qualitative or quantitative monitoring indicators that would trigger immediate remedial, preventative or any other management action, other than to 'review provisions if required'.[129] Rather, monitoring indicators were typically stated to be relevant for statutory reviews, every five to ten years.[130] Only a very small number of statutory plans have, in fact, been reviewed and/or replaced in compliance with those statutory timeframes.[131] 'Trigger' mechanisms that result in changes to management over the life of a management plan could be far more effective for adaptive management as the climate changes. Indeed, this process of 'repeatedly going through the steps of the [adaptive management] cycle' is the 'essence of transforming ordinary management into true adaptive management'.[132]

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[129] NGNM South West MP, 88.

[130] Eg Woodvine MS, 32, 'A key ingredient to this management is monitoring and evaluating the implementation of the plan. For this, two reviews are committed at five and 10 year intervals'.

[131] All of the Commonwealth plans have been updated at some stage; ten of the Victorian plans reviewed for this research had been republished following a review, in almost exactly the same form as the older iteration; many ageing protected area plans were updated when they were brought within the NGNM South West MP, Alpine MP 2016 and TWWHA 2016 planning areas, because those plans each cover such a large area; in other cases, especially in Tasmania, plans have been updated to increase access or development rights rather than to comply with formal review obligations, eg *Freycinet National Park Management Plan 2004* altering the 2000 iteration to facilitate construction and operation of extended potable water storage capacity, and the redevelopment of the Wineglass Bay lookout track, and the *Freycinet National Park Management Plan 2016* removes restrictions, set in previous plans, on accommodation capacity in the Freycinet Lodge lease.

[132] Open Standards, above n 68, 37.

The Open Standards specifically adopt an ‘interim’ review trigger, relying on short reporting cycles to ensure that misdirected, ineffective or actively harmful management actions are identified as early as possible and changes are made to remedy the problem.[133] The Open Standards are open source standards for systematic, adaptive and accountable conservation management; integrating exhaustive monitoring and auditing controls while leaving wide discretion for actual site-specific management decisions.[134] Monitoring and monthly reporting cycles are designed to track progress towards overarching goals over time, feeding into larger-scale reviews on, for example, five-yearly cycles that are reported publically.[135]

A particularly important component of completing the adaptive management cycle, and especially for triggering changes to management during the life of a statutory plan, is a clear link between desirable outcomes, monitoring targets, and thresholds for action. As noted above, the task of connecting clearly defined thresholds with responsive management actions, was all but absent in the management plans reviewed for this research. Adaptation-oriented management plans should define explicit thresholds for desirable and undesirable levels of change. These thresholds may only need to be developed for the prioritised goals described in Section 6.5.3, but they should be clearly defined, measurable thresholds of change. Each threshold should have a specific management action attached to it, for example, ‘if [threshold] is reached during the life of this plan then [responsible actor] will take [action] and the results will be monitored. After [period of time] the results of [action] will be assessed and [either a new threshold will be set or new management actions prescribed]’.[136] This approach can trigger a review of critical thresholds and actions – without having to wait for a whole-of-plan review – and has the potential to arrest maladaptive management approaches before it is too late to reverse them.

There may be some challenges to implementing the Open Standards effectively in the public protected area estate. For example, up-front investment in identifying critical

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[133] Ibid 34.
[134] Ibid.
[135] Taylor, Fitzsimons and Sattler, above n 38, 76.
[136] Lindenmayer, David B, Maxine P Piggott and Brendan A Wintle, ‘Counting the books while the library burns: why conservation monitoring programs need a plan for action’ (2013) 11(10) *Frontiers in Ecology and the Environment* 549; Wilgen and Biggs, above n 102, 1182 ‘Table 2’.

threats, clear conservation goals and an holistic understanding of the management context may be resisted, particularly if it were to be applied to the thousands of individual public protected areas across the country. Difficulties might also arise in securing lasting funding for ongoing monitoring to trigger practical changes to management. However, lessons from implementing the Open Standards in large-scale, multi-tenure initiatives such as Gondwana Link could inform application of the standards to public protected area management.[137]

6.6 Conclusion

Funding shortfalls and a growing politicisation of conservation management, especially public conservation management,[138] represent consistent challenges to effective, adaptation-oriented management in the NRS. While acknowledging these challenges, this chapter illustrates the need for Australian conservation laws, policies and statutory protected area management plans to acknowledge the challenge of rapid climate change for biodiversity in the NRS. Biodiversity within protected areas will inevitably change over time, especially as a result of changing habitat conditions, extreme events, species redistributions, and growing extinction risks. Management plans should clearly identify the outcomes that are sought in each protected area, placing a greater emphasis on completing the adaptive management cycle, to improve the likelihood of those outcomes being achieved.

One of the few plans reviewed for this chapter that explicitly addresses the climate adaptation challenge is a plan for a Tasmanian island reserve, which states:

> Climate change is, of course, a global issue and there are no specific management actions that could be undertaken on the islands that would halt or reduce the impact of this threat. Neither is it realistic to anticipate any local adaptation measures, such as the building of barrages that could protect the wetlands from inundation. Support

[137] Open Standards, above n 68, 'Case studies: Gondwana Link, lessons learnt from a global biodiversity hotspot' <http://cmp-openstandards.org/case-study/gondwana-link-lessons-learnt-from-a-global-biodiversity-hotspot/>.
[138] Debus, Hon B, *All living things are diminished: breaking the national consensus on the environment* (The Whitlam Institute, University of Western Sydney, 2014).

> for local, state and national initiatives to combat climate change as part of an international effort is the best response available to managers of the islands.[139]

This sombre assessment of the reserve's prospects under future climate change provides a reminder that even well-funded, adaptation-oriented management may not be enough to avoid ecosystem transformation or loss; in some cases the magnitude of change will be too great and the pace of change too fast. However, it provides a strong reminder of the urgent imperative to develop and implement adaptation-oriented management approaches for protected areas, and biodiversity more generally, across the Australian landscape.

The next chapter provides a detailed analysis of the third adaptation strategy, to reduce or remove the effect of non-climatic stressors on biodiversity. Non-climatic stressors such as invasive species, inappropriate fire regimes and native vegetation clearing have a significant and detrimental effect on biodiversity located both within and outside of the protected area estate. These stressors undermine adaptive capacity and increase the vulnerability of plants, animals and ecosystems to climate driven extinction and transformation. Reducing the effect of existing non-climatic stressors will also significantly improve the chances of adaptation-oriented management conserving biodiversity as the climate changes.

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[139] Egg Islands MP, 17.

Table 6-1 Selected examples of provisions in Commonwealth, Victorian and Tasmanian statutory management plans

Extracts from statutory management plans	**Reference type / Plan**
(a) Examples of references to the concept of climate change (Section 6.3.1)	
Circumstances that might lead to amendment of the plan include: …the results of monitoring or research, management experience or new information (such as a new threatening processes, significant climate change or a large-scale fire event) which indicate the need for a change in management direction [*this is the only reference to climate change in the 80 page plan*].	*Reference in passing*: Baw Baw MP, 2
Weather conditions sometimes prevent visitor access and pose safety risks for inexperienced or ill prepared visitors. In other places, the possible effects of global warming on the future of skifields are being seriously considered. The same issues are confronted by the Ben Lomond skifield.	*Reference to projected climate impacts in the specific reserve*: Ben Lomond MP, 10
…in addition to vegetation condition, monitoring of any altitudinal change of existing tree cover should commence in order to give base line data as to where the current tree line stops and to identify vegetative creep as a result of the impact of climate change. Although climate change is not considered to be a short-term threat to the Park's vegetation, it is important to collect base-line data on whether tree cover is beginning to establish at higher altitudes. This could be done relatively easily using GPS to record altitude at given points along the current tree line, and repeating this exercise every five years.	*Prescription – action within the reserve*: Wellington Park MP, 215
Identify important areas on adjacent private properties to enable the landward retreat of coastal vegetation from the reserve. Liaise with the owners of the relevant properties to raise awareness about the importance of the areas and how to manage areas facing expected sea- level rise due to climate change; and, if appropriate, encourage protection through covenants and other measures.	*Prescription – action outside the reserve*: Pitt Water MP, 14

Extracts from statutory management plans	**Reference type / Plan**
(b) Examples of references to the concept of climate refugia (Section 6.3.2)	
While climate change projections are uncertain, reducing existing threats to particularly vulnerable species can help to optimise their resilience to changing climatic conditions. Some species dependent on refuges with ephemeral water supplies may be particularly susceptible.	*Reference to refugia in the specific reserve*: Uluṟu Kata Juta MP, 61
Where possible and practical, implement strategies and actions to protect values threatened by climate change; such as, the identification of terrestrial and aquatic refugia that strengthen ecosystem resilience and support adaptation…	*Prescription – identify refugia*: TWWHA 2016, 122
Manage water assets in a landscape-scale approach to ensure survival through dry years, enable recovery in wetter years, continue essential supply of high quality water and conserve aquatic refugia to minimise the impacts of climate change on water and catchments.	*Prescription – protect refugia*: NGNM South West MP, 49
Because of its age and its extraordinary topographic complexity, the stone country has long served as a refuge area for biodiversity… The stone country has also provided refuge for species that cope poorly with fire. This capacity to provide refugia will become more important under changing climatic conditions.	*Reference to historical refugia and their role in future conservation under climate change*: Kakadu MP, 60
(c) Examples of provisions to implement the concept of adaptive management (Section 6.3.3)	
Monitor and manage grazing in the Otway Forest Park under existing licences and to minimise impacts on other park values.	*Prescription – monitoring*: Great Otway MP, 77

Extracts from statutory management plans	**Reference type / Plan**
Monitor tracks for erosion condition, the presence of Spanish heath and other weeds and vegetation susceptibility to Phytophthora cinnamomi. Where erosion is found, then construction of water bars or similar should be considered.	*Actions to follow from monitoring*: Woodvine MS, 31
Performance indicators for natural heritage management [include]: • The extent, structure and species composition of native vegetation communities are maintained; • High priority areas are rehabilitated with native flora that is self-sustaining seven to ten years after planting; • Populations of threatened and significant terrestrial native species and red crabs are maintained or increase; • Populations and impacts of cats, rats and invasive weeds are reduced and crazy ant supercolonies cease to form;…	*Prescription with qualitative targets*: Christmas Island MP, 38
<u>Outcome 1</u>: Degraded bare earth areas have decreased and native vegetation cover is re-establishing in former degraded sites. <u>Monitoring actions</u>: …establish reference set of monitoring sites and photo points for evaluating effectiveness of the planned closures; …measure or estimate area of bare earth in each degraded site; … <u>Great result</u>: by 2015 native grassland re-established on 85% of area of bare earth; <u>Acceptable result</u>: by 2015 native grassland re-established on 50% of area of bare earth; <u>Unacceptable result</u>: by 2015 area of bare earth has increased.	*Prescription with quantitative targets*: Conningham MS, Appendix 1, ii
(d) Examples of provisions that are responding to some of the challenges of climate change (Section 6.4)	
[Recognising that]… natural systems are dynamic and changing in response to many processes, which can of themselves alter Park values either dramatically and rapidly (such as bushfire) or slowly (such as the impact of changing weather patterns)…	*Management must respond to ongoing environmental change*: Wellington Park MP, 56
[Responses to change include incorporating] the likelihood and impact of increasing frequency of extreme fire events in planned burning regimes.	Draft Alpine MP, 37

Extracts from statutory management plans	**Reference type / Plan**
Landscape change is inevitable. Some threats and their impacts may not be able to be controlled or mitigated to the extent necessary to retain all existing park values… [and in response] [i]dentifying acceptable levels of ecosystem and species change in response to climate change predictions.	*Identify acceptable levels of environmental change and prioritise responses*: Christmas Island MP, cl 4.6.4(b), 41, 63
Further work is needed to understand how different systems are affected and to prioritise management responses, acknowledging that in some cases there may be management actions that can mitigate the impacts of climate change, while in other situations responses may be limited to documenting values that are likely to be lost.	TWWHA 2016, 117
(e) Examples of provisions that fail to effectively implement adaptive management 6.3.3 [paraphrased except when in quotation marks]	
• Management objective: reduce the potential for impacts as a result of SLR by implementing environmental flows. • Management action: discuss ‘the implementation of the environmental-flow strategy’ with third parties including Hydro Tasmania, NRM South and the Derwent Estuary Program. *Comment: the management task is to have a discussion, not reduce potential impacts – objective/action link is weak*	*No link between management objectives or challenges and actions to address them*: Murphys Flat MS, 6
• Management objective: ‘maintain or improve the distribution and abundance of species native to Norfolk Island, and the ecosystems and processes upon which they depend’. Measure of success: maintenance/improvement of distribution and abundance – both for of threatened species and native non-threatened species. • Monitoring actions: targeting ‘EPBC Act listed threatened species, and seabirds’; and ‘trends in the distribution, breeding and numbers of listed threatened species’. Management actions: none specified. *Comment: the plan does not link monitoring actions to the aims of the earlier section, nor set triggers for management or management actions; and it does not set monitoring targets for the abundance of non-listed species except seabirds.*	Norfolk Island MP, 68-9

Extracts from statutory management plans	**Reference type / Plan**
• Management objective: ‘implement adaptive management, where suitable, to… assist vegetation communities to respond to the threats of climate change… [and] assist habitats and fauna species to survive threats of climate change’. *Comment: There is no indication of how that should happen, what happens next, whether there is any threshold for the agency to act, any monitoring or measurement that will be relevant or important.* • Monitoring action: ‘Implement monitoring programs to enable the effectiveness of key management programs to be evaluated and to inform adaptive improvements’. *Comment: the only management action identified to flow from monitoring is to ‘Monitor equestrian use of the trails to identify threats to the natural and cultural values and develop adaptive management strategies to reduce threats including potential seasonal closures’.*	*No detail of specific actions to be taken*: Devilbend MP, 18, 20, 24 and 35.
• Monitoring action: ‘Monitor authorised activities to ensure conditions of authorisation are met’. *Comment: if monitoring highlighted a failure to meet the conditions of authorisation, some form of action would, presumably, be taken, but the plan does not identify what, by whom, any threshold for determining non-compliance, or a timeframe for acting. There is also no indication that high rates of non-compliance identified through monitoring might lead to any amendments to the plan or this management strategy.*	*No link between monitoring and management responses*: Great Otway MP, 79

Chapter 7 Reduce non-climatic stressors to enhance adaptive capacity

7.1 Introduction

Chapters 5 and 6 provided a detailed analysis of how Australia's protected area laws and policies implement the protected area and connectivity adaptation strategies. Those chapters proposed a series of reforms to improve implementation of those strategies, and to maximise biodiversity conservation outcomes as the climate changes. Yet a variety of historical and ongoing stressors other than climate change currently threaten Australia's biodiversity, referred to here as 'non-climatic stressors'; and these stressors are often not regulated by conservation laws. Non-climatic stressors may be a direct threat to species and ecosystems, for example, through hunting, fishing and predation by invasive species; or they may be indirect, for example, increasing density and urbanisation of human populations can trigger habitat loss at the peri-urban fringe.[1] These stressors range from global in scale, such as the rapid international movement of goods, through to regional and local scales, such as land use changes, pollution and inappropriate fire regimes.[2]

Non-climatic stressors currently present a more significant threat than climate change to many Australian species, ecological communities and ecosystems.[3] However, non-climatic stressors also increase climate sensitivity and vulnerability and undermine the adaptive capacity of Australia's biodiversity.[4] Indeed, the most significant impacts of climate change for biodiversity, in many cases, will be the interactions between climatic and

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[1] Maxwell, Sean L et al, 'The ravages of guns, nets and bulldozers' (2016) 536 *Nature* 143; Hajkowicz, Stefan A, Hannah Cook and Anna Littleboy, *Our future world: global megatrends that will change the way we live, 2012 revision* (CSIRO Futures, 2012); Cresswell ID and HT Murphy, *Australia State of the Environment 2016: Biodiversity* (Independent report to the Minister for the Environment and Energy, Commonwealth Government, 2017) <https://soe.environment.gov.au/theme/biodiversity> ('SotE 2016').
[2] SotE 2016, above n 1.
[3] Woinarski JCZ, AA Burbidge and PL Harrison, 'Ongoing unraveling of a continental fauna: decline and extinction of Australian mammals since European settlement' (2015) 112(15) *PNAS* 4531; SotE 2016, above n 1.
[4] SotE 2016, above n 1, 14-38; Steffen, W et al, *Australia's biodiversity and climate change: a strategic assessment of the vulnerability of Australia's biodiversity to climate change* (Biodiversity and Natural Resource Management Adaptation Team, Commonwealth Department of Climate Change, 2009).

non-climatic threats.[5] As a result, reducing or removing the effect of non-climatic stressors is recognised as a crucial strategy for facilitating biodiversity adaptation as the climate changes.[6]

A detailed analysis of law and policy for every non-climatic stressor is beyond the scope of this thesis and these legal frameworks are already the subject of extensive policy and scholarly critique.[7] However, given that the purpose of this thesis is to outline how key adaptation strategies can be operationalised through legal reform, it is nonetheless important to demonstrate how this essential strategy can be achieved. This chapter therefore takes a selective approach, focusing on legal frameworks for the two non-climatic stressors that research participants identified as the most important stressors for biodiversity: land clearing and invasive species.

Section 7.2 summarises the primary interview data underpinning the decision to focus on land clearing and invasive species in this chapter. Section 7.3 investigates legal frameworks for land clearing, which was identified in interviews and broader conservation scholarship as the most important non-climatic stressor for Australian biodiversity.[8] Many examples used in this section were drawn from research interviews, demonstrating the value of the socio-legal approach to supplementing doctrinal analysis of laws and policies with practical experiences of the law's implementation.[9] Section 7.4 analyses the complex

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[5] Driscoll, Don A et al, 'Priorities in policy and management when existing biodiversity stressors interact with climate-change' (2011) 111(3-4) *Climatic Change* 533; IPCC, 'Summary for policymakers' in CB Field et al (eds), *Climate Change 2014: Impacts, Adaptation and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the fifth assessment report of the IPCC* (Cambridge University Press, 2014) 2.3.

[6] Heller, Nicole E and Erika S Zavaleta, 'Biodiversity management in the face of climate change: A review of 22 years of recommendations' (2009) 142(1) *Biological Conservation* 14, 18; Mawdsley, JR, R O'Malley and DS Ojima, 'A review of climate-change adaptation strategies for wildlife management and biodiversity conservation' (2009) 23(5) *Conserv Biol* 1080; Australian Department of the Environment, *Terrestrial Biodiversity Assessment 2008* (2008) 150-151.

[7] Eg Feehely, J, N Hammond-Deakin and F Millner, *One Stop Chop: how Regional Forest Agreements streamline environmental destruction* (Lawyers for Forests, 2013); Australian Network of Environmental Defender's Offices Inc ('ANEDO'), *Assessment of the adequacy of threatened species & planning laws* (Places You Love Alliance and ANEDO, 2014).

[8] Eg Reside AE et al, 'Ecological consequences of land clearing and policy reform in Queensland' (2017) 23 *Pacific Conservation Biology* 219; Bradshaw CJA, 'Little left to lose: deforestation and forest degradation in Australia since European colonization' (2012) 5(1) *Journal of Plant Ecology* 109; in answer to research question (RQ) RQIII: *To what extent are these strategies currently represented in Australia's legal frameworks for conservation?* and RQIV: *To what extent do Australian legal frameworks for conservation hinder or promote the effective implementation of these strategies?*

[9] Chapter 2, Section 2.3.

Australian regulatory framework for invasive plants and animals, drawing again on both doctrinal analysis and interview data.[10] This chapter proposes legal reforms to reduce the effects of both stressors on biodiversity.[11] As in previous chapters, reform recommendations draw on three legal design principles: taking a proactive approach, improving both accountability and flexibility, and prioritising adaptive management.[12]

7.2 Results: key non-climatic stressors for biodiversity adaptation

Each interview participant was asked to identify the non-climatic stressor(s) that they considered 'most problematic' for facilitating biodiversity adaptation and which, with the necessary resources, they would 'take off the table'. Interviewees described seven distinct stressors for biodiversity, summarised in Table 7.1. To identify the most commonly referenced categories, stressors were grouped either because they are regulated under the same laws and policies; or because they have a connected or consistent effect on species and ecosystems. For example, planning and native vegetation laws regulate both land clearing and habitat loss and degradation, so those stressors were grouped together under the heading 'land clearing'. Biosecurity laws restrict *new* invasive species entering the country, while weed, pest and feral species laws regulate the management, control or eradication of *established* invasive species, so both were grouped under the heading 'invasive species'.

The data obtained from interviews are consistent with recent international and Australian scholarship and government reporting. For example, Australia was recently identified as an international vegetation clearing 'hotspot'; and land clearing or habitat loss consistently tops the list of threats to Australian threatened species and ecological communities.[13] Invasive species, and especially feral cat and fox predation on small native mammals, also threaten a large proportion of Australia's threatened species. Feral cats have been

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[10] In answer to RQIII and RQIV, above n 8.
[11] In answer to RQV: *How can Australian law be reformed to improve the representation and implementation of these strategies?*
[12] Chapter 4, Section 4.3.
[13] Australian Government, 'Australian State of the Environment reports' <https://soe.environment.gov.au/download/reports>, including reports for the Australian State of the Environment 2016, 2011, 2006 and 2001.

identified as a leading cause of Australia's mammal extinction rate, which is the highest in the world.[14]

Table 7.1 also records interview participants' proposals for responding to the stressors that they identified. Some of these proposals reflect an ideal implementation of existing laws and/or practices, such as creating new reserves and constructing predator-proof fences. Some would require new approaches to implementing existing laws, such as ensuring that planned 'mitigation' burns include a focus on biodiversity conservation outcomes; while others would require legal reform, such as an absolute ban on native vegetation clearing.

Non-climatic stressors identified by research participants

Stressor	***No.***	***Participants' proposals for responding to this stressor***
Land clearing [*including fragmentation/ ecosystem destruction/ conversion/ habitat loss/degradation/ mature habitat loss*]	16	• absolute ban on any further clearing (including native forest logging) • identify refugia and high quality habitat and create many more new reserves • balance clearing and development more effectively • identify shared values and ensure that planning respects the conservation of those values
Invasive species [*biosecurity/ invasive plants, animals/ feral horses, cats/alien pathogens*]	15	• act early and fast on incursions • implement strong and proactive biosecurity regulation, including for pathogens • predator proof fences
Humans [*values/ attitudes/ access/ engagement*]	9	• generate shared understanding and shared commitment to conservation goals • create roles for community education • promote local ownership of conservation challenges and stewardship of local natural assets
Fire [*alpine fire/ prescribed burn targets*]	4	• abolish percentage-based targets for planned burns • direct where planned burns are focused to ensure effective outcomes for biodiversity
Resource extraction/exploitation [*exploiting raw materials/*	2	• foster industry innovation, eg horizontal drilling techniques • improve information gathering and sharing

[14] Woinarski, Burbidge and Harrison, above n 3; SotE 2016, above n 1, 135-8; invasive species are not a new threat to Australian biodiversity, State of the Environment 2011 Committee, *Australia: State of the Environment 2011* (Independent report to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities, Australian Government, 2011) ('SotE 2011') 629; these two stressors are also the most commonly cited threats to nationally listed threatened species.

consumption and development/ coal seam gas extraction/ no cumulative impact studies on water resources]		between industry and government, and between different scales of government • undertake comprehensive cumulative impact studies • impose strict regulation on chemicals in CSG operations
Fragmented planning between catchments, coasts and marine areas	2	• develop effective and integrated planning and policy for coastal areas • connect law and policy for terrestrial and marine environments through coastal planning
Environmental watering and changing hydrology	1	• reintroduce and enhance environmental flows for iconic wetlands along the Murray-Darling river system
Total responses:	**49**	
Total number of participants:	**40**	

Table 7-1 Non-climatic stressors identified in research interviews as the 'most significant for biodiversity adaptation'

7.3 Land clearing

Large, intact and ecologically complex areas of vegetation provide habitat for species and sustain ecological communities and ecosystem processes.[15] For the purposes of this analysis, vegetation is not limited to forests and other tree-centric ecological communities but includes wetland and riparian vegetation and grasslands.[16] It is also increasingly clear that regrowth, mixed native and non-native vegetation communities, and small patches – not just large, contiguous areas – can provide important habitat, connectivity and 'buffering' roles for biodiversity, especially in otherwise heavily cleared landscapes.[17]

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[15] Watson, JEM et al, 'Catastrophic declines in wilderness areas undermine global environment targets' (2016) 26(21) *Current Biology* 2929.
[16] Australian native grasslands have been particularly heavily cleared for agriculture, but they are difficult to define and so, difficult to conserve; native vegetation regulations do not necessarily apply to these 'other' forms of vegetation, eg in Tasmania, regulations apply to clearing 'woody' native vegetation (trees) and (listed) threatened native vegetation communities, but clearing non-woody, non-threated vegetation is generally unregulated, Tasmanian Forest Practices Authority, *Information on land clearing controls in Tasmania: version 1.6* (September 2017) 2; *cf* eg *Local Land Services Act 2013* (NSW) s 60B.
[17] Bowen, Michiala E et al, 'Regrowth forests on abandoned agricultural land: a review of their habitat values for recovering forest fauna' (2007) 140(3) *Biological Conservation* 273; Munro, Nicola T, David B Lindenmayer and Joern Fischer, 'Faunal response to revegetation in agricultural areas of Australia: a review' (2007) 8(3) *Ecological Management & Restoration* 199.

Land clearing results in habitat loss and is the most significant driver of species and ecological community decline and extinction in Australia.[18] Historical clearing practices have left just 25% of Australia's original native vegetation extent, intact.[19] However, that statistic is distributed unevenly across vegetation and community types; with less than 1% of the original extent remaining for some ecological communities, and many more heavily fragmented and close to collapse.[20]

Agriculture and urban development are the primary drivers of native vegetation clearing – from broad scale remnant vegetation clearing through to removing individual paddock trees[21] – for stock grazing, feed production and irrigation, and for housing and infrastructure development on the outskirts of major cities.[22] The effects of these land clearing drivers are compounded by land degradation pressures from unsustainable grazing, 'insect attack, disease, weeds, rising water tables, salinity, inappropriate fire management, unsustainable firewood gathering and neglect'.[23]

Land clearing has both direct and indirect effects on biodiversity. Direct effects include contractions in species' ranges, habitat loss and species extinction,[24] and old tree death and declines in remnant vegetation communities and ecosystems, especially when they are

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[18] Woinarski, J et al, 'Monitoring change in the vertebrate fauna of central Queensland, Australia, over a period of broad-scale vegetation clearance' (2006) 33 *Wildlife Research* 263; Vine, Samantha et al, *KBAs in danger: the state of Australia's Key Biodiversity Areas in 2017* (BirdLife Australia, 2017); Johnson, C et al, *Impacts of land clearing: the impacts of approved clearing of native vegetation on Australian wildlife in New South Wales* (WWF-Australia, 2007); Neldner, VJ et al, *Scientific review of the impacts of land clearing on threatened species in Queensland* (Independent report to the Queensland Department of Science, Information Technology and Innovation, 2017).

[19] SotE 2016, 'Land' theme, above n 1, noting that 13% of the estimated extent of Australia's original native vegetation is completely converted to other land uses and another 62% has been disturbed or modified to some degree, at 3.

[20] SotE 2016, above n 1; Council of Australian Governments ('COAG') Standing Council on Environment and Water, *National framework to guide the ecologically sustainable management of Australia's native vegetation* (COAG and the Commonwealth Department of the Environment and Water, 2012) ('Native Vegetation Framework') 4.

[21] Law, BS, M Chidel and G Turner, 'The use by wildlife of paddock trees in farmland' (2000) 6 *Pacific Conservation Biology* 130; NSW Office of Environment and Heritage, 'Removal of dead wood and dead trees – key threatening process listing' <http://www.environment.nsw.gov.au/determinations/DeadwoodRemovalKtp.htm>.

[22] Australian Department of the Environment and Water, 'Native vegetation in Australia' <http://www.environment.gov.au/land/vegetation/index.html>; Burgman MA et al, 'Threat syndromes and conservation of the Australia flora' (2004) 134(1) *Biological Conservation* 73.

[23] Native vegetation in Australia, above n 22; Bates, Gerry, *Environmental Law in Australia* (LexisNexis, 9th edition, 2016) 519.

[24] Burgman et al, above n 22.

isolated in otherwise cleared landscapes.[25] Indirect effects include changes in fire regimes that impede native vegetation life cycles, alter soil properties and hydrological regimes, and expose native animals to increased predation.[26] Reducing or removing land clearing as a stressor for biodiversity would have a significant effect on the capacity of plants, animals and ecosystems to recover from past stress and adapt as the climate changes.

Until recently, the threat posed by ongoing land clearing for biodiversity had plateaued, though past clearing practices continue to have legacy effects such as reduced habitat availability and landscape fragmentation.[27] The impact of clearing on the Australian environment was assessed in 2011 as being 'very high' but improving, with the enactment of strict controls on broad scale clearing resulting in a 'general reduction in the clearing of land in recent years'.[28] However, native vegetation clearing has increased rapidly since legislative controls in Queensland were wound back in 2013, and there is potential for the rate and scale of clearing in New South Wales and Victoria to increase following recent reforms to native vegetation laws and policies in those states.[29]

Land clearing is one of the most politically challenging and polarising environmental issues in Australian environmental law.[30] However, effective regulation can reduce the threat of land clearing to biodiversity – an outcome demonstrated clearly in Queensland, where clearing rates fell in response to legislative controls, and increased rapidly when those controls were repealed.[31] The remainder of Section 7.3 considers existing legal

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[25] SotE 2011, above n 14, 627; Native Vegetation Framework, above n 20, vi.
[26] SotE 2011, above n 14, 627.
[27] Ibid 568.
[28] Ibid 640, recognising substantial diversity across the country in the rate of clearing and the effect of historical practices.
[29] *Native Vegetation Management Act 1999* (Qld); SotE 2016, above n 1, vi; Hamman, Evan, 'Failed changes to Queensland's vegetation clearing laws: implications for climate change, the Great Barrier Reef and Australian environmental policy' (2016) 31(8) *Australian Environment Review* 303; an attempt in 2016 by the (then) new Labor government to reimpose strict controls on broad scale clearing in Queensland was unsuccessful, and clearing continues at historically high levels with major negative implications for biodiversity.
[30] Bricknell, Samantha, *Environmental crime in Australia: research and public policy series 109* (Australian Institute of Criminology, 2010); interviews #1 (government), #29 (government).
[31] McGrath, Christopher J, 'End of broad scale clearing in Queensland' (2007) 24(1) *Environmental and Planning Law Journal* 5; Evans, Megan C, 'Deforestation in Australia: drivers, trends and policy responses' (2016) 22(2) *Pacific Conservation Biology* 130; Bartel R and E Barclay, 'Motivational postures and compliance with environmental law in Australian agriculture' (2011) 27(2) *Journal of Rural Studies* 153.

frameworks for regulating land clearing, recommending reform to reduce the effect of this stressor on biodiversity.

7.3.1 Current legal framework

Land clearing was, until relatively recently, condoned and even encouraged in Australia by agricultural incentives and government schemes that saw clearing as a 'property improvement' exercise.[32] That is no longer the case, and every Australian state and territory now regulates clearing in some way, including through specific native vegetation legislation and/or regulations,[33] broad natural resources management legislation[34] or through land use planning frameworks.[35] The Commonwealth government has also introduced a *National Framework to Guide the Ecologically Sustainable Management of Australia's Native Vegetation* ('Native Vegetation Framework').[36] The framework is designed to apply targets from *Australia's Biodiversity Conservation Strategy 2010-2030* directly to native vegetation management;[37] although if it has had any practical effect, it has certainly not been to support Australian land managers in achieving ecological sustainability in vegetation management.[38]

Laws to regulate land clearing and habitat loss are generally targeted at either broad scale clearing in rural and agricultural contexts or at clearing as a form of 'development' in land use planning.[39] They range from legal obligations to remove certain vegetation to outright prohibitions on land clearing. In a local government planning context, including for peri-urban land clearing, bushfire regulations and codes require landowners to create and

[32] Australian Institute for Criminology, above n 30, 'Illegal native vegetation clearing'.
[33] Eg *Native Vegetation Act 1991* (SA) and *Native Vegetation Regulations 2017* (SA); *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (WA); *Forestry Practices Act 1985* (Tas) for threatened native vegetation communities listed under the *Nature Conservation Act 2002* (Tas).
[34] Eg *Local Land Services Act 2013* (NSW).
[35] Eg Victorian Planning Provisions ('VPPs') and native vegetation guidelines (the VPP is a statutory instrument setting out standard provisions for Victorian local government planning schemes, developed under the *Planning and Environment Act 1987* (Vic)); and local council planning schemes in Tasmania for locally significant vegetation.
[36] Native Vegetation Framework, above n 20.
[37] Ibid vi-vii; the Australian Biodiversity Conservation Strategy targets are aimed at halting ongoing declines in biodiversity to 'achieve healthy and resilient biodiversity' and thus 'provide a basis for living sustainably'; on the lack of progress on these aims; Humane Society International (2015) *Australia's Biodiversity Conservation Strategy 2010-2030: an independent review of progress* (2015).
[38] See Section 7.3.2.
[39] Bates, above n 23, 519.

maintain a cleared area around new development to reduce bushfire risks.[40] Vegetation that obstructs visibility on a road or highway or that obstructs powerlines[41] may also need to be removed.[42] Most jurisdictions also require both government and landowners to eradicate certain vegetation from their properties, especially listed weeds.[43]

Some vegetation clearing is unregulated and can take place without a permit or any other legal scrutiny. For example, trees or boughs that are dead and have become dangerous can usually be removed without a permit provided they are not, for example, protected as ‘significant trees’.[44] Vegetation may be cleared for landscaping or ‘vegetation management’ if it does not fall into a category such as threatened vegetation, landslip or contaminated land, and does not otherwise require a permit.[45] Native timber can be collected for firewood in certain areas;[46] and where native vegetation legislation focuses primarily or exclusively on managing ‘woody vegetation’ – that is, trees – clearing vegetation such as non-threatened grasslands or coastal heath may not trigger permitting requirements.[47] In some circumstances, regrowth vegetation can also be cleared without a permit. For example, in Victoria, regrowth that has naturally established or regenerated after lawful clearing – not including natural disasters – and is less than 10 years old, may be cleared without a native vegetation clearing permit.[48]

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[40] Eg Victoria’s planning scheme defines this cleared area requirement as ‘defendable space’; note the extent of the required cleared area can generally be reduced by increasing a development’s construction standard to a higher rated Bushfire Attack Level (‘BAL’): VPP 52.47, ‘Planning for bushfire’.
[41] Tasmanian interim planning schemes provide a ‘general exemption’ for ‘vegetation clearing or modification for electricity infrastructure’; eg Hobart City Council, *Hobart interim planning scheme* (2015) (‘Hobart interim planning scheme’) cl 5.13.
[42] Eg *Local Government (Highways) Act 1982* (Tas) ss 39, 42; *Roads and Jetties Act 1935* (Tas).
[43] Mandated clearing of weeds may have unexpected implications for native species’ habitat in areas where native vegetation is absent; eg gorse (*Ulex europaeus*) is a nationally significant listed weed and a declared weed in Tasmania but, in the heavily cleared Tasmanian Midlands agricultural area, has been observed providing habitat for native threatened wildlife, interview #18 (research), #19 (NGO).
[44] Eg Hobart interim planning scheme cl 6.3.2(i); listed vegetation such as ‘significant trees’ are mapped by councils and cannot be harmed without a permit, Kingborough City Council, *Significant tree register policy: policy 5.9* (2014) (‘Kingborough significant tree policy’).
[45] Eg Hobart interim planning scheme cl 6.31, cl 6.3.2 ‘vegetation planting, clearing or modification’.
[46] Eg Victorian Department of Environment, Land, Water and Planning, ‘Domestic firewood collection on public land’ (2015) <http://www.depi.vic.gov.au/?a=177495>; though permits are required in some jurisdictions for domestic firewood collection, eg *Forest Practices Act 1985* (Tas) and Forestry Practices System incorporating permits for firewood collection.
[47] Eg Tasmanian Forest Practices Authority, above n 16, 2.
[48] VPP 52.17, ‘native vegetation’; cl 52.17-7 ‘table of exemptions’; in Tasmania, a Forest Practices Plan is not required for clearing native vegetation regrowth; Hamman, above n 29, 307-8.

In every state and territory, certain native vegetation clearing activities require a valid permit or approved statutory plan. For example, clearing associated with a new development generally requires a planning permit under local government planning schemes.[49] In some areas, clearing any native vegetation – even non-threatened vegetation – requires a permit. For example, the Kingborough City Council in Tasmania requires a council permit to lop or remove any native tree that is: greater than 80cm in circumference; listed on the Council's significant tree register; or protected under covenant or a conservation agreement under the *Land Use Planning and Approvals Act 1993* (Tas).[50] Similarly, the Victorian Planning Provisions ('VPPs') provide that vegetation specified in a schedule to a Vegetation Protection Overlay cannot be removed, destroyed or lopped without a permit[51] unless it is explicitly exempt or permitted.[52]

Land clearing is generally restricted in relation to protected vegetation and ecological communities that are listed as threatened under conservation legislation or located within a protected area.[53] For example, a Forest Practices Plan that permits and controls clearing, harvesting or converting threatened native vegetation in Tasmania may only be granted in exceptional circumstances. An applicant must demonstrate that the clearing will have an 'overall environmental benefit' or is 'unlikely to detract substantially' from conservation of the ecological community or other values in its vicinity.[54] The *Forest Practice Act 1985* (Tas) creates additional restrictions on clearing, including requiring a certified Forest Practices Plan before harvesting tree ferns, or clearing any native vegetation on 'vulnerable

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[49] Eg Kingborough City Council, *Kingborough interim planning scheme* (2015) ('Kingborough interim planning scheme'); VPP 52.17-1, 'Native vegetation: permit requirement'.
[50] Kingborough City Council, *Health and Environmental Services By-law 3 of 2011* (2011).
[51] VPP 42.02, 'Vegetation protection overlays'; Victorian Department of Environment, Land, Water and Planning, *Guidelines for the removal, destruction or lopping of native vegetation* (2017) <https://www.environment.vic.gov.au/__data/assets/pdf_file/0021/91146/Guidelines-for-the-removal,-destruction-or-lopping-of-native-vegetation,-2017.pdf>.
[52] VPP cl 52.16, 'schedule'; VPP 42.02-2; eg clearing is exempt from a permit when it involves hand cutting by surveyors to establish a line of sight, or clearing to maintain the safe and efficient function of a railway, clearing permitted under a 'native vegetation precinct plan' or under legislation for geothermal energy exploration and extraction.
[53] Eg threatened vegetation listed under the *Nature Conservation Act 2002* (Tas) Sch 3A or managed under a protected area statutory management plan.
[54] Tasmanian Forest Practices Plans ('FPPs') and the *Forest Practices Code 2000* are established under the *Forest Practices Act 1985* (Tas); a permit is not required under the *Threatened Species Protection Act 1995* (Tas) for 'taking' a listed threatened species in accordance with a certified FPP, One Stop Chop, above n 7, 43.

land'.[55] Vulnerable land is defined in the *Forest Practice Regulations 1997* (Tas) to include land on a heavy slope and land within a streamside reserve, among other things.[56]

Under existing Regional Forest Agreements ('RFAs') between the Commonwealth and each of the state governments in New South Wales, Victoria, Tasmania and Western Australia,[57] the relevant states have undertaken to prohibit broad scale clearing within their jurisdictions. For example, the Tasmanian government undertook to introduce a policy preventing clearing of any more than 20ha over a five year period by 2015. However, in the policy that was eventually released, in June 2017, the Tasmanian government has exempted agricultural clearing from that prohibition, allowing up to 40 hectares of vegetation on agricultural land to be cleared annually, provided none of the vegetation is listed as a 'threatened native vegetation community' under the *Nature Conservation Act 2002* (Tas).[58]

In many jurisdictions, despite apparent prohibitions on native vegetation clearing, clearing may nevertheless be permitted if it is offset by protection or restoration of another sites under biodiversity offsetting schemes.[59] The theory and practice of offsetting has been the source of strident criticism, not least because offsetting schemes often operate to circumvent clearing controls without producing the ecological benefits promised.[60]

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[55] *Forest Practices Act 1985* (Tas) ss 17(4), 20.
[56] *Forest Practice Regulations 1997* (Tas) reg 3.
[57] The Commonwealth government has signed five RFAs with Victoria, three with NSW and one each with WA and Tasmania, Australian Department of Agriculture and Water Resources, 'Regional Forest Agreements' (2017) <http://www.agriculture.gov.au/forestry/policies/rfa>.
[58] *Nature Conservation Act 2002* (Tas) Sch 3A; the policy prohibits clearing of more than 20 hectares of private forest over five years (except for agricultural purposes) unless it is provides a 'substantial public benefit'; Tasmanian Department of State Growth, *Tasmanian Government policy for maintaining a permanent native forest estate* (4 June 2017) <https://www.stategrowth.tas.gov.au/energy_and_resources/forestry/native-forest>.
[59] An 'offset' or compensation for clearing may involve protecting other populations of the native vegetation community on the project site, in another location, or indirectly through the payment of a set amount of money into a conservation fund; eg Commonwealth Department of the Environment and Energy, *EPBC Act Environmental Offsets Policy* (2012) ('Commonwealth offsets policy'); NSW Office of Environment and Heritage, *NSW Biodiversity Offsets Policy for Major Projects* (2014); *Environmental Offsets Act 2014* (Qld), *Environmental Offsets Regulation 2014* (Qld) and *Queensland Environmental Offsets Policy 2016: version 1.2*; Poulton, David W, *Key issues in biodiversity offset law and policy: a comparison of six jurisdictions* (Ontario Nature's Greenway Guide Series, 2015).
[60] Gordon, A et al, 'Perverse incentives risk undermining biodiversity offset policies' (2015) 52(2) *Journal of Applied Ecology* 532; Bull, Joseph W et al, 'Biodiversity offsets in theory and practice' (2013) 47(3) *Oryx* 369.

7.3.2 Challenges for responding to land clearing as a biodiversity stressor

There has been a demonstrable failure of law, policy and leadership at every level of Australia’s native vegetation management regime.[61] For example, the national Native Vegetation Framework[62] has failed to address the unsustainable exploitation of native vegetation in Australia, at least in states with the greatest rates of land clearing.[63] At the state and territory level, many forms of clearing are exempt from legal oversight, are governed by ‘self-assessable codes’ or can be permitted without reference to protecting or improving ecological function and health.[64] Legal reform to relax prohibitions on broad scale clearing is a particularly significant challenge for reducing land clearing and associated habitat loss, especially for remnant native vegetation on agricultural land.[65] Many forms of clearing are declared to be exempt from permitting, or are permitted, without ongoing monitoring or cumulative accounting, and ‘no go zones’ where clearing is absolutely prohibited are extremely rare.

More complicated are the trade-offs between conservation laws, and legal frameworks for drivers of land clearing such as forestry and agriculture, which have resulted in substantial conservation losses and exacerbate threats to biodiversity. For example, habitat loss is listed as a primary threat to the survival of two critically endangered species, the Swift Parrot (*Lathamus discolour*) a migratory species that breeds only in Tasmania, and the Leadbeater’s Possum (*Gymnobelideus leadbeateri*) in Victoria. However, native forest logging continues in both states, across the known habitat of each species, approved under RFAs that exempt logging activities from assessment under the national *Environment Protection and Biodiversity Conservation Act 1999* (Cth). Prioritising investment in the

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[61] Bates, above n 23, describing the ongoing loss of native vegetation as ‘arguably one of Australia’s most significant examples of environmental mismanagement’, at 519; Reside et al, above n 8.
[62] Native Vegetation Framework, above n 20.
[63] SotE 2016, above n 1; Queensland Government, ‘Statewide Landcover and Trees Study (SLATS) 2015-16’ <https://www.qld.gov.au/environment/land/vegetation/mapping/slats-reports#slats-most-recent-reports> (‘SLATS 2015-16’).
[64] Walmsley, Rachel, ‘Biodiversity law update: a recipe for regulatory failure?’ (2017) 61(3) *Nature New South Wales* 8; WWF-Australia, *Accelerating bushland destruction in Queensland: clearing under self-assessable codes takes major leap upward* (WWF Briefing, 2017).
[65] SLATS 2015-16, above n 63; Evans, above n 31.

recovery of these species without also addressing a fundamental threat to their survival in the form of native timber logging, is nonsensical.[66]

Trade-offs are also common in land use planning frameworks. For example, some planning instruments set strategic environmental goals, as with bushfire protection zones, to ensure that 'any biodiversity and environmental objectives specified in the planning scheme are compatible with planned bushfire protection measures'.[67] However, the development control strategies that sit under those strategic instruments tend only to consider whether risks to 'human life, property and community infrastructure' can be reduced to an acceptable level.[68] These operational decisions are not required to balance bushfire risk mitigation against the value of functioning ecosystems, ecological health and species' habitat. The resulting loss of environmental values in bushfire risk mitigation is a major problem in a country where high ecological value-vegetation is often co-located with the highest levels of bushfire risk.

Land clearing is not just a central focus of this non-climatic stressor strategy, but also of the connectivity adaptation strategy. Clearing vegetation, including forests, grasslands and even individual trees, can cause landscape fragmentation, which is the fundamental problem that the connectivity strategy is designed to overcome. A formal legal framework for facilitating connectivity could be used to moderate growing rates and scales of land clearing, prioritising both native vegetation protection and proactive, adaptation-oriented restoration of historically cleared areas. However, no such legal framework exists in Australia.[69] As discussed elsewhere in this thesis, the failure to legislate or implement a comprehensive policy and land use planning approach to landscape-scale connectivity may hinder independent and planned adaptation, and constitute a lost opportunity to improve the condition, status and adaptive capacity of Australian biodiversity.

Despite these failings, some opportunities to improve Australia's land clearing laws and practices, and restrict particularly damaging clearing, do exist. For example, at a political

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[66] This issue is the subject of current litigation before Justice Mortimer in the Federal Court of Australia, Victoria Registry, VID1228/2017 (filed 13 November 2017); for details of logging in Swift Parrot habitat under the Tasmanian RFA, see Vine, above n 18, 15.
[67] Victorian State Planning Policy Framework, VPP 13.05-1.
[68] Eg ibid 6.
[69] Chapter 3, Section 3.3.2.

level, the recently re-elected Labor government in Queensland has promised to tighten legislative restrictions on land clearing in that state.[70]

Conservation laws could also play an intermediary role in some states, to facilitate conservation of high priority habitat over competing land uses. For example, in some jurisdictions, conservation legislation enables habitat that is essential to the survival of a listed, threatened species to be designated ‘critical habitat’.[71] Critical habitat attracts additional legal protections, including from activities that could harm or degrade the value of the area as habitat for that species, and prioritised management funding through species recovery planning processes. This mechanism is under-utilised and often ineffective in Australia,[72] but has the potential to be implemented and enforced without the need for legal reform. Critical habitat designations could also be used as a prioritisation tool – restricting land clearing in areas with important habitat for conserving listed species and ecological communities, with flow on benefits for other biodiversity distributed in those areas.

7.3.3 Recommendation 1: take proactive approaches to land clearing regulation

The first legal design principle introduced in Chapter 4 is to ‘adopt more proactive approaches to conservation’. In the context of land clearing, restricting ongoing clearing is fundamental, but will not be sufficient to conserve biodiversity. Historical clearing has reduced the habitat available to many species, fragmented remaining habitat and movement

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[70] Queensland Cabinet and Ministerial Directory, ‘Joint media statement: excessive tree clearing skyrockets due to LNP’, (Thursday, 5 October 2017) <http://statements.qld.gov.au/Statement/2017/10/5/excessive-tree-clearing-skyrockets-due-to-lnp>; along with what appears to be a new, more rigorous approach to enforcement, Queensland Department of Natural Resources, Mines and Energy, ‘Media statement’ (18 Dec 2017) <https://www.dnrm.qld.gov.au/our-department/news/2017/december/vegetation-clearing>; Slezak, M, ‘Queensland farmer fined and ordered to restore cleared native vegetation’, *The Guardian* online (20 Dec 2017) <https://www.theguardian.com/environment/2017/dec/20/queensland-farmer-fined-and-ordered-to-restore-cleared-native-vegetation?CMP=share_btn_link>.

[71] *Flora and Fauna Guarantee Act 1988* (Vic) s 20; *Nature Conservation Act 1992* (Qld) s 97; *Threatened Species Protection Act 1995* (Tas) s 23.

[72] Vine, above n 18; Hagen, Amy and Karen E Hodges, ‘Resolving critical habitat designation failures: reconciling law, policy, and biology’ (2006) 20(2) *Conserv Biol* 399; Australian Conservation Foundation, Birdlife Australia and Environmental Justice Australia, *Recovery planning: restoring life to our threatened species* (2015).Critical habitat critique

corridors, and affected ecological interactions,[73] demanding new legal approaches to restoration, the management of vegetation protected from land clearing, and the creation and in some cases, active management of novel habitat.

(a) Facilitate adaptation-oriented ecological restoration

For those native vegetation communities that have been heavily cleared, prohibiting future clearing will not be enough to reduce the effects of their decline on biodiversity.[74] Alongside tighter controls on future vegetation clearing, the law must also promote adaptation-oriented restoration. There are few obligations imposed in law to revegetate, restore or rehabilitate vegetation.[75] Such obligations generally only arise in the context of funding incentives, such as the Commonwealth government's Landcare and Green Army tree planting programmes, or as a penalty in litigation for breaching conservation legislation, for example, for destroying protected values such as native vegetation and hydrological processes in a protected area.[76] Even then, the law rarely requires more than returning the land or ecological community to a specified prior state.[77] Apart from the difficulty – perhaps impossibility[78] – of successfully achieving that prior state, restoration and rehabilitation projects that fail to anticipate future conditions will be less likely to address the legacy of historical vegetation clearing and provide new areas of functional, complex and adaptive habitat.

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[73] Gibson, Luke et al, 'Near-complete extinction of native small mammal fauna 25 years after forest fragmentation' (2013) 341(6153) *Science* 1508; Mitchell, Matthew GE et al, 'Reframing landscape fragmentation's effects on ecosystem services' (2015) 30(4) *Trends in Ecology & Evolution* 190.
[74] Maggini, Ramona et al, *Optimal habitat protection and restoration for climate adaptation, final report* (National Climate Change Adaptation Research Facility, 2013); Le Roux, DS et al, 'Reduced availability of habitat structures in urban landscapes: implications for policy and practice' (2014) 125 *Landscape and Urban Planning* 57; Perring, Michael P. et al, 'Advances in restoration ecology: rising to the challenges of the coming decades' (2015) 6(8) *Ecosphere* 1.
[75] Chapter 4, Section 4.3.
[76] Eg *Great Lakes Council v Lani* (2007) 158 LGERA 1, where the respondent had cleared vegetation from an endangered ecological community and the court ordered remediation measures by an expert bush regenerator and an ecologist.
[77] Eg *Minister for the Environment and Heritage v Greentree (No. 3)* (2004) LGERA 136; interview #6 (advocate).
[78] Hilderbrand, RH, AC Watts and AM Randle, 'The myths of restoration ecology' (2005) 10(1) *Ecology and Society* 19, arguing that nature is too complex to be replicated, especially using simplistic guiding principles; Mackie, AR et al, 'Not all kinds of regrowth are created equal: regrowth type influences bird assemblages in threatened Australian woodland ecosystems' (2012) 7(4) *PLoS ONE* e34527.

New legal approaches are required to plan for 'the sort of… ecosystems or nature that we want, rather than just continuing to try to protect little bits of what's left'.[79] Recent conservation law reform proposals include the need to focus on landscape-scale approaches and restoration, especially where historical clearing has left landscapes heavily fragmented.[80] In Victoria, Environmental Justice Australia has proposed a new statutory planning mechanism, the 'Victorian Conservation and Restoration Strategy', that would be operationalised through 'landscape action plans for identified regional landscapes'.[81] These plans would set measurable, enforceable targets for conservation, restoration and integrated land management. Without a national commitment to effective bioregional planning, overarching planning instruments such as the Strategy proposed by EJA could be implemented in each state and territory to improve the integration and enforcement of vegetation management decisions in every jurisdiction. Such reform would benefit from an enforceable statutory obligation on public decision makers to 'further' the strategy's goals for restoration and landscape-scale conservation in any decision they make.[82]

(b) Improve incentives for proactive management where land clearing is restricted

While legislative controls appear to be fundamental to achieving widespread reductions in clearing, the law has very little to say about how land protected from clearing can be improved and managed to facilitate biodiversity conservation.[83] Proactive management obligations and/or incentives to improve the status, condition and adaptive capacity of ecosystems will become even more important as climate change triggers a growing range of weed incursions, new fire regimes and species redistributions. While designing more effective incentives for proactive management is not a new recommendation,[84] in practice,

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[79] Interview #6 (advocate).
[80] Bradshaw, above n 8, recommending urgent conservation of large-scale remnant patches and a greater focus on restoration in fragmented areas across landscapes, especially in iVictoria; Environmental Justice Australia ('EJA'), *Fixing Victoria's broken nature laws: a reform proposal for the Flora and Fauna Guarantee Act* (2016) ch 5, recommending a new focus on landscapes and restoration in Victorian conservation legislation.
[81] EJA, above n 80, 4.
[82] Chapter 4, Section 4.2.
[83] Evans, above n 31; Harris, Collin, 'History of agriculture in South Australia: native vegetation heritage' (Primary Industries and Regions South Australia, 2017) <http://www.pir.sa.gov.au/aghistory/natural_resources/native_vegetation_conservation/national_parks>; Farrier, David, 'Conserving biodiversity on private land: incentives for management or compensation for lost expectations' (1995) 19 *Harv. Envtl. L. Rev.* 303, 323-6.
[84] Ibid.

existing incentive schemes are often short term or insufficient to motivate conservation-oriented behaviour.[85] This is particularly the case in agricultural regions, where large areas of land may be targeted for clearing, the cost of proactive management is high, and clearing will often provide greater financial returns than the incentives on offer.[86] Despite these challenges, notable existing incentive schemes for proactive land management include Victoria's innovative 'EcoMarkets', including *BushTender*,[87] *EcoTender*[88] and *BushBroker*[89] schemes; and long-term stewardship agreements coordinated by non-government organisations such as the Tasmanian Land Conservancy's *Midlands Conservation Fund*.[90] Incentives to proactively manage vegetation on land outside the formal protected area estate should be supported in law and policy to go further than reducing the threat of land clearing and create biodiversity 'gains'.

(c) Protect novel and non-native 'critical' habitat

In some cases, 'natural' habitat cannot be restored, either at all, or in the timeframe required to avoid a species' extinction. In such cases, artificial habitat may be able to reduce the effects of habitat loss as a biodiversity stressor. For example, Tasmania's Lake Pedder no longer provides 'natural habitat' for freshwater plant and animal species because it is the site of impoundments and diversions constructed in 1972 to support a major hydro-electric scheme. A Tasmanian freshwater fish endemic to the original lake, the Pedder galaxias (*Pedagalaxis*) now only survives in a translocated population in Lake

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[85] Interviews #22 (government), #23 (consultant); in-perpetuity conservation covenants, which typically prohibit or restrict land clearing and impose proactive management obligations on covenantees, rarely include financial compensation, including for ongoing management costs; Evans, above n 31.
[86] Interviews #9 (government), #19 (NGO), #22 (government), #38 (research).
[87] Under which private landholders compete in a reverse auction, nominating a cost for actively managing native vegetation on their land, including fencing to exclude stock, controlling environmental pests and weeds, and revegetation and restoration activities; successful landholders enter a contract with the Victorian Government or a regional Catchment Management Authority to receive periodic payments for providing the proposed management actions, Victorian Department of Environment, Land, Water and Planning, *EcoMarkets: valuing our environment* (2008) 9.
[88] Ibid; expanding the BushTender program beyond native vegetation, including to management actions for river and estuary health.
[89] Ibid; a native vegetation offsets scheme for generating, trading and selling 'credits' to other landowners that are required under legislation to offset native vegetation clearing by purchasing 'like for like' credits.
[90] Tasmanian Land Conservancy, 'Midlands conservation fund' <http://tasland.org.au/programs/midlands-conservation-fund/>.

Oberon, where it is not native, and in a constructed concrete habitat near Strathgordon,[91] which is neither ‘natural habitat’ nor ‘wild’. Loss of these non-native habitats would certainly result in the species’ extinction and they should be protected in decision making on that basis. Non-native pine trees play a similar habitat role for the endangered Carnaby’s black-cockatoo (*Calyptorhynchus latirostris*) in southwest Western Australia, where harvesting in a non-native pine plantation has been blamed for a 53% decline in the population since 2010.[92] Constructed, novel and non-native habitat may not be ecologically equivalent to natural habitat,[93] but where it is the only option for a species’ persistence, the law should protect it as if it were.

7.3.4 Recommendation 2: accountable flexibility, triage and non-regression

The second legal design principle described in Chapter 4 is to promote accountable flexibility. This principle captures the dual need to improve flexibility in the range of *outcomes* available in any particular situation, while ensuring that decision-making *processes* are measured against clearly defined standards to improve accountability and transparency. Two important components of this principle are: the need to implement triage approaches subject to explicit, preferably legislative, prioritisation criteria; and to ensure that the implementation of legal frameworks and any proposed law reform are progressive, not regressive.

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[91] Commonwealth Department of the Environment and Energy, ‘Galaxias pedderensis (*Pedder Galaxias*)’ (Advice to the Commonwealth Minister for the Environment and Heritage from the Threatened Species Scientific Committee, 2005) <http://www.environment.gov.au/node/16477>; interview #18 (research).
[92] The five largest roost sites for this species are in a pine plantation on the Swan Coastal Plain, the subject of softwood harvesting by the state government; Western Australian Department of Parks and Wildlife, *Carnaby’s Cockatoo (Calyptorhynchus latirostris) recovery plan* (Western Australian Wildlife Management Program No 52, 2013); Wildie, Tom ‘Carnaby's cockatoos may vanish from Perth unless pine clearing stopped, WWF says’, *ABC online* (24 February 2017) <http://www.abc.net.au/news/2017-02-24/carnabys-cockatoos-could-be-lost-perth-due-to-clearing-wwf-warns/8298830>.
[93] Le Roux, DS et al, ‘Enriching small trees with artificial nest boxes cannot mimic the value of large trees for hollow-nesting birds’ (2015) 24 *Restoration Ecology* 252; newly planted eucalypt forests will take many hundreds of years to reach the maturity required to provide habitat hollows and food but endangered Swift Parrots (*Lathamus discolor*), close to extinction, have been observed using constructed nesting boxes – this interim habitat may be sufficient to see the species persist; interview #18 (research).

(a) Triage criteria: defining bioregional thresholds for cumulative impacts

Every incidence of land clearing has both independent and cumulative effects on biodiversity. For example, removing a local example of a particular habitat type has implications for the species and communities distributed there, but also contributes to regional and continental biodiversity loss, fragmentation, and future habitat availability under climate change. Legal frameworks have been unable to respond effectively to the challenge of the cumulative implications of land clearing for biodiversity.[94]

The accountable flexibility design principle provides some insights in this regard. For example, if the application of native vegetation controls is considered as a form of triage – to focus regulatory efforts on the most critical vegetation types or locations – then explicit, statutory criteria could define ecological thresholds beyond which any further clearing would be prohibited, either within the same bioregion or across the continent. Some planning approaches do acknowledge the effect of cumulative impacts. For example, VicSmart planning assessment clause 93.06 requires Victorian local council decision makers to take into account, among other things, the ‘cumulative impact of the number of trees that have been removed or been approved for removal in the past 3 years’.[95]

Overcoming the hazard of cumulative environmental impacts across landscapes and tenures is a task particularly well-suited to bioregional planning.[96] Bioregional planning is a mechanism established under section 176 of the EPBC Act, to support planning for an area or region that guides social, economic and environmental activities over time. Bioregional plans focus particularly on the ecologically sustainable management of natural

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[94] Eg Hawke, Allan, *The Australian Environment Act: report of the independent review of the Environment Protection and Biodiversity Conservation Act 1999* (Report to the Commonwealth Department of the Environment, Water, Heritage and the Arts, 2009) 54.

[95] VicSmart is a streamlined assessment process for straightforward planning applications in Victoria; note, cl 93.06 does not appear to set criteria for determining the severity of any cumulative impact or the decision-making implications of a determination that any such impact is substantial and, of course, the impact of land clearing can accumulate over far longer periods than three years.

[96] Pope, Jenny and Susan A Moore, *Planning and assessment for biodiversity conservation at a landscape-scale: an evaluation of current approaches and opportunities in Australia* (A report for the National Environmental Research Program, 2013); Australian Panel of Experts on Environmental Law, *Terrestrial biodiversity conservation and natural resources management* (Technical Paper 3, 2017) 25-26, supporting the use of bioregional planning to integrate management of issues such as pests across tenures.

resources.[97] A bioregional plan could be used to define 'red zones' or 'no go zones' where vegetation and habitat loss cannot effectively be offset, and so clearing in those areas would be prohibited. Bioregional planning processes under the EPBC Act and in state legislation could also help to identify remnant native vegetation and adaptation-oriented ecological values such as climate refugia and corridors for species redistribution. It could be used to prioritise vegetation management; provide a framework for improving land use decisions where native vegetation clearing is proposed; reduce the effects of land clearing as a biodiversity stressor; as well as streamlining assessment and approval processes for development in less-sensitive areas.[98]

Bioregional planning should be accompanied by greater statutory support – at Commonwealth, state and territory and local scales – for decision makers to refuse to permit development that is likely to result in unacceptable biodiversity outcomes, especially as a result of a well-recognised stressor such as land clearing.[99] Interviewees for this research highlighted a need for particular support for local government decision makers who, with limited budgets, can face strong pressure to permit development, including development that may affect or destroy locally significant biodiversity, or risk technical and resource-intensive planning appeals.

(b) Non-regression in biodiversity offsetting

The concept of non-regression is a core component of the accountable flexibility principle. It could improve biodiversity offsetting laws and policies by supporting their implementation and reform in a way that is environmentally progressive, not regressive.[100]

Offsetting biodiversity losses from development in one location, by offering conservation gains elsewhere, has been promoted as a way of pursuing development and improving

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[97] As opposed to strategic planning, which is similarly focused on the landscape-scale but is more reactive, often oriented around a specific development plan, policy or program for an area; Pope and Moore, above n 96, 8, 16; a similar mechanism exists in NSW in the form of a biodiversity certification scheme in the *Biodiversity Conservation Act 2016* (NSW) Part 6, certifying future development in an assessed area, removing the need for additional future biodiversity impact assessments.
[98] APEEL, above n 96; Hawke, above n 94, 165.
[99] Interviews #21 (advocate), #34 (government); the concept of 'unacceptable outcomes' would, of course, have to be clearly defined in legislation or policy; as the climate changes, unacceptable outcomes may not necessarily be limited to outcomes for *threatened* species and ecological communities but may include impacts on ecological function or integrity.
[100] Chapter 4, Section 4.3.

flexibility for developers while also achieving positive environmental outcomes.[101] Whether such a balance is possible, and whether current offsetting laws and policies can achieve it, are both hotly contested questions.[102] For example, offsetting regimes have been criticised for failing to ensure that proposed offset outcomes for biodiversity are achieved and sustained.[103] Despite serious questions raised in a growing body of scholarship about the validity of claims that offsetting benefits the environment, or even prevents environmental harm,[104] offsetting schemes are unlikely to be dismantled.[105] Where land clearing is an unavoidable consequence of a particular development proposal, and its effects on biodiversity cannot be mitigated, 'best practice' offsetting principles should be enforced, including transparent accounting mechanisms, a strict requirement for net gains, in perpetuity, and appropriately resourced enforcement mechanisms.[106]

As the climate changes, fundamental failures in the design, implementation and enforcement of biodiversity offsetting schemes may dramatically increase the risk of biodiversity decline and species extinctions.[107] Legal reform will be necessary to improve

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101 Eg NSW Office of Environment and Heritage, *Assessing and offsetting impacts on biodiversity* (2016) <http://www.environment.nsw.gov.au/biodivoffsets/>; Commonwealth offsets policy, above n 59, 4.

102 Maron, Martine et al, 'Faustian bargains? Restoration realities in the context of biodiversity offset policies' (2012) 155 *Biological Conservation* 141; McDonald, Jan, Phillipa C McCormack and Anita Foerster, 'Promoting resilience to climate change in Australian conservation law: the case of biodiversity offsets' (2016) 39(4) *UNSW Law Journal* 1612.

103 May, Jelena, Richard J Hobbs and Leonie E Valentine, 'Are offsets effective? An evaluation of recent environmental offsets in Western Australia' (2017) 206 *Biological Conservation* 249; Gordon, Ascelin et al, 'FORUM: Perverse incentives risk undermining biodiversity offset policies' (2015) 52(2) *Journal of Applied Ecology* 532.

104 BenDor, T, 'A dynamic analysis of the wetland mitigation process and its effects on no net loss policy' (2009) 89 *Landscape Urban Planning* 17; Hilderbrand, RH, AC Watts and AM Randle, 'The myths of restoration ecology' (2005) 10(1) *Ecology and Society* 19; Bedward et al, 'Simple modelling to assess if offsets schemes can prevent biodiversity loss, using examples from Australian woodlands' (2009) 142(11) *Biological Conservation* 2732; Maron et al, above n 102; Maron et al, 'Can offsets really compensate for habitat removal? The case of the endangered Red-Tailed Black Cockatoo' (2010) 47 *Journal of Applied Ecology* 348, 348; Gibbons Philip and David B Lindenmayer, 'Offsets for land clearing: no net loss or the tail wagging the dog' (2007) 8(1) *Ecological Management and Restoration* 26.

105 Indeed, before offsets were available, inappropriate land clearing was often approved without any compensation for lost habitat and ecosystem function; so, pragmatically, offsetting may be better than nothing in some cases, interview #23 (consultant).

106 Walmsley R, M Kessler and J Hallinan, 'Fundamental principles for best practice biodiversity offsets' (2014) 96(Sept) *IMPACT!* 1, 5-6; Tlozek E, 'Environmental experts warn biodiversity offsets not being applied or enforced' *ABC World Today* (Radio program, 10 August 2015); Business and Biodiversity Offsets Programme ('BBOP'), *To no net loss and beyond: an overview of the business and biodiversity offsets programme* (2013); *Northern Inland Council for the Environment Inc v Minister for the Environment* [2013] FCA 1418.

107 For the mismatch of offsetting schemes to the challenges posed by climate change, see McDonald, McCormack and Forster, above n 102.

the likelihood of offsets achieving conservation outcomes and avoid offsets being implemented in environmentally regressive ways. However, proposed reforms to legal frameworks for biodiversity offsetting must be closely scrutinised, to ensure that they do not reduce or undermine conservation standards. As argued in Chapter 4, a statutory obligation to include a ‘statement of environmental regression’ with any legislation tabled in an Australian Parliament that reduces conservation standards could improve accountability and may reduce the likelihood of regressive, non-adaptive legal reforms being proposed in the first place.[108]

7.3.5 Recommendation 3: prioritise adaptive management

The legal design principle of prioritising adaptive management for conservation requires, at the outset, a greater commitment to monitoring land clearing activities, gathering and disseminating data, and periodically reviewing regulatory activities and outcomes. Despite many decades of regulation, major monitoring and analysis gaps remain, undermining efforts to conduct evidence-based, land clearing law reform.[109] Queensland’s ‘Statewide Land Cover and Tree Study’ (‘SLATS’) provides an example of how this kind of data could be collected and reported, and a similar process should be adopted in other states. However, SLATS misses a large amount of clearing that is conducted under self-assessable codes and outside the permitting process, and more comprehensive records, though no doubt exceptionally difficult to obtain, would also likely paint a disturbing picture of the full extent of unregulated clearing across Australia.[110]

Tracking the number of clearing permits granted, while also gathering data on actual vegetation loss through satellite imagery and self-reporting, could help to track the cumulative effects of small-scale and legally permissible clearing and trigger changes to improve decision making for broader landscape and bioregional conservation goals, over time.[111] As discussed elsewhere in this thesis, improved monitoring is fundamental but not sufficient for effective adaptive management. Practical changes to ‘on-ground’

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[108] As with the *Victorian Charter for Human Rights and Responsibilities Act 2006* (Vic), see Chapter 4, Section 4.3, Principle 2.
[109] Evans, above n 31.
[110] SLATS 2015-16, above n 63.
[111] Obligations may be imposed through state legislation or led by a Council of Australian Governments (COAG) initiative.

management must also be triggered by improvements in underpinning information. For example, and in addition to the bioregional planning response proposed above, pre-defined ecological thresholds could help to address cumulative impacts by changing the issues relevant to ongoing land management and development applications decisions that involve land clearing. To ensure that ecological thresholds are appropriate and robust, initial data gathering would need to be appropriately resourced, the thresholds themselves revisited on legislated, regular intervals, and effective enforcement mechanisms put in place.

7.3.6 Additional recommendations

In addition to the three design principles discussed above, there are fundamental flaws in land clearing laws that must also be addressed to reduce the impact of this stressor on biodiversity.

(a) Remove perverse incentives

As a starting point, perverse land clearing incentives should be eliminated from land use planning and natural resources laws. As noted above, regrowth vegetation is usually exempt from regulations on land clearing until the vegetation reaches a certain age. This creates a perverse incentive to regularly clear regrowth vegetation, to avoid having to apply for a permit and to retain land use flexibility. It also perpetuates the legacy effects of clearing, even if it is not necessary to remove regrowth for the effective and efficient use of historically cleared land.[112] While the ecological values of regrowth vegetation can differ greatly from vegetation prior to clearing, regrowth can, nevertheless, provide much-needed habitat, particularly in heavily cleared landscapes, and provide a valuable opportunity to reverse the effect of historical clearing for certain vegetation types.[113] Further, exempting regrowth from permitting requirements means that there is no way to measure or account for regrowth clearing in broader trends of vegetation loss. Regrowth exemptions and other incentives to clear vegetation should be revoked,[114] and could be replaced with a

[112] Interviews #22 (government), #30 (advocate).
[113] Bowen et al, above n 17; Munro, Lindenmayer and Fischer, above n 17; Mackie et al, above n 78.
[114] These may include agricultural incentives associated with low-interest or no-interest government loans and natural disaster recovery grants, Evans, above n 31.

streamlined, short-form application process for 're-clearing', similar to Victoria's VicSmart streamlined assessment processes for straightforward applications.[115]

(b) Impose clearing restrictions for a broader range of biodiversity values

Clearing that affects non-threatened ecological communities, including 'non-woody' vegetation types such as grasslands and shrubs, also need to be the subject of more effective clearing controls and management. An approach similar to conserving 'significant trees' at the local scale could be defined more broadly to apply to 'vegetation', drawing attention to the value of a variety of vegetation types for biodiversity. For example, Kingborough City Council has implemented a mechanism for tracking and conserving *non-threatened* trees, using a significant tree register.[116] The register is designed to conserve 'individual or small groups of trees, rather than large areas of trees that are already protected… as threatened vegetation communities', whether they occur on private or publicly-owned land.[117] The categories of significance for trees in the Kingborough area include:

- aesthetic significance;
- size – height, circumference, canopy;
- age;
- landscape significance;
- historical significance – European, Aboriginal or other;
- rarity of species, variety or genome; and
- unusual physical features.[118]

A tree listed as significant cannot be cut, removed or altered without express Council approval; and may be the subject of an interim listing, preventing interference until a full

[115] See VPP 93.06-2, 'remove, destroy or lop a tree'.
[116] Implemented under the Kingborough City Council, *Health and Environmental Services By-Law No.3 of 2011* (2011); with the potential to play a crucial role in conserving old, urban trees as 'keystone ecological structures', Lindenmayer, DB et al, 'New policies for old trees: averting a global crisis in a keystone ecological structure' (2014) 7 *Conservation Letters* 61.
[117] Kingborough significant tree policy, above n 44, [3.2]; a landowner's permission is not required for a tree on private land to be registered as a 'significant tree', provided it falls into one or more of the significance categories and the Assessment Panel approves its registration, at [4.9].
[118] Ibid 1-2.

assessment is complete.[119] This policy demonstrates one method for ascribing explicit value to non-threatened native vegetation for habitat and other social and environmental benefits. This concept could be applied more broadly, and with a more holistic focus, to conserve biodiversity values such as grasslands and riparian habitat, along with ecological interactions and ecosystem processes.

7.4 Invasive species

Invasive species and pathogens have many direct and indirect effects on Australian biodiversity, through competition and predation, and by changing ecological interactions and ecosystem functions with potentially cascading effects.[120] These direct and indirect effects on biodiversity are substantial, for example, 'weed invasion' is a threatening process for one-third of listed threatened species in Australia.[121] However, separating out and measuring the specific impacts of invasive species on Australian biodiversity is difficult, because they interplay with other stressors and defy straightforward, targeted management responses.[122]

The financial impact of invasive species on agricultural systems, including control costs and lost production, is substantial. In 2004, weeds were estimated to cost farmers $4 billion per year and feral animals an additional $720 million per year.[123] An estimate was not available for the financial impact of freshwater pests, invertebrates generally, or diseases for Australian agriculture. The cost of invasive species' impacts on threatened native species and the health and functions of ecosystems is difficult to calculate, and generally not described in economic terms. This is because many of the ecological effects of invasive species are not measured, such as 'competition for nesting sites, or for food and water; contamination of rivers and water holes; harm to habitats [and] disruption of

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[119] Ibid [4.13], a full assessment of interim listed trees must be completed within four months.
[120] Invasive alien species and pathogens are plants, animals and pathogens that have been introduced into Australia from elsewhere and have established populations, Department of the Environment, Water, Heritage and the Arts, Commonwealth Government, *Assessment of Australia's terrestrial biodiversity 2008* (2009) Part 5.6.
[121] SotE 2011, above n 14, 633.
[122] SotE 2011, above n 14, 638 identified invasive species as '…one of the most potent, persistent and widespread threats to Australian biodiversity'; Ritchie, Euan G et al, 'Continental-scale governance and the hastening of loss of Australia's biodiversity' (2013) 27(6) *Conservation Biology* 1133.
[123] Australian Biosecurity Group, *Invasive weeds, pests and diseases: solutions to secure Australia* (CRC for Pest Animal Control, CRC for Australian Weed Management, Canberra, 2005) 6.

ecosystems'.[124] However, given the cost estimates for the agricultural sector, and the effort invested by that sector in invasive species management and eradication, the harm to native biodiversity is certainly substantial. Further, for some invasive species such as feral cats, there are few or no proven methods of large-scale eradication and implementing the limited methods of control available is exceptionally difficult.[125]

Climate change will exacerbate the effect of established invasive animals and plants on Australia's biodiversity.[126] Climate change will also trigger conditions for new species to become invasive. Conditions conducive to new invasions include shifting temperature and rainfall patterns triggering species redistributions; extreme events; and human degradation and fragmentation of ecosystems, which also increase other non-climatic threats to biodiversity.[127] New plant invasions, in particular, will increase because of carbon dioxide fertilisation, increased dispersal and pollination of weeds by changing animal behaviour, and will transform ecosystems as weeds influence ecological feedback loops.[128]

Efforts to use conservation legal frameworks to address the threat of invasive species – including through threat abatement and species recovery planning processes – will be unsuccessful without parallel efforts under biosecurity laws to prevent new invasive species from establishing in Australia. Laws that support eradicating or managing established invasive species will also be critical for future conservation. The remainder of this section outlines the legal frameworks for biosecurity and invasive species

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[124] Martin, Paul et al, *Improving invasive animal institutions: a citizen-focused review of institutional arrangements for invasive animal management (Program 4)* (Invasive Animals Cooperative Research Centre, Canberra, 2014) 9.
[125] Woinarski, Burbidge and Harrison, above n 3; Doherty, TS et al, 'Invasive predators and global biodiversity loss' (2016) 113 *PNAS* 40.
[126] Invasive Species Council ('ISC'), 'Invasive animals and climate change: factsheet' (2009a) 2 <https://invasives.org.au/wp-content/uploads/2014/02/fs_animalsandclimatechange.pdf>; ISC, 'Weeds and climate change: factsheet' (2009b) 2-3 <https://invasives.org.au/wp-content/uploads/2014/02/fs_weedsandclimatechange.pdf>.
[127] ISC 2009a, above n 126, 1-2; ISC 2009b, above n 126, 1-2, 3; interview #35 (government) raised the rapidity of international air travel as a major conservation challenge for the future, '…now that air traffic is so efficient we're getting stuff come from China and stuff come from South America and vice versa, and at a pace that can accommodate survival of [alien] pathogens… well, I know it is the biggest threat. It's always on our mind'.
[128] Low, Tim, 'Climate change and invasive species: a review of interactions' (Independent report to the Biological Diversity Advisory Committee to the Commonwealth Minister for the Environment and Heritage, 2008).

management, the major challenges to achieving better outcomes for Australian biodiversity under these laws, and opportunities for reform.

7.4.1 Current legal framework

Australia has an international obligation to address the effect of invasive species on biodiversity under the Convention on Biological Diversity ('CBD'), which requires state parties to 'prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species'.[129] Alien species under the CBD include species introduced outside of their 'natural past or present distribution' and, as such, 'can include species that are not native to a particular part of Australian territory, as well as species that are not native to [the] Australian territory as a whole'.[130]

Australian law implements this obligation through two forms of laws:[131]

- Commonwealth and state biosecurity legislation and regulations, which control the introduction of species into the country or a state or territory for the first time; and
- State weed and pest animal legislation and regulations, for eradicating, controlling and managing established invasive species.

Alongside legislative approaches, there is a bewildering array of policy and governance structures for invasive species control and management. There is a range of national and multi-state instruments, agencies and frameworks, including the National Pest Animal and National Weed strategies;[132] the Australian Customs and Border Protection Service; the Biosecurity arm of the Commonwealth Department of Agriculture and Water Resources; the National Biosecurity Committee and its cross-jurisdictional sub-committee the Invasive Plants and Animals Committee; the Intergovernmental Agreement on Biosecurity and

[129] *Convention on Biological Diversity*, opened for signature 5 June 1992, 1760 UNTS 79 (entered into force 29 December 1993) ('CBD'), Art 8(h); Riley, S, 'Using Threatening Processes to protect freshwater biodiversity from invasive alien species' (2012) 11(1) *Canberra Law Review* 58, 64.
[130] Explanatory Memorandum, Biosecurity Bill 2014 (Cth), 77.
[131] Conservation laws provide an additional legal tool in the form of statutory lists of threatening processes but, as discussed below, these are the not the focus of this chapter.
[132] Commonwealth Department of Agriculture and Water Resources, *Australian pest animal strategy: a national strategy for the management of vertebrate pest animals in Australia* (2017); Commonwealth Department of Agriculture and Water Resources, *Australian weeds strategy: a national strategy for weed management in Australia* (2017).

operational agreements under COAG – such as the National Environmental Biosecurity Response Agreement; and the National Landcare Programme, which allocates Commonwealth support to regional and NRM projects for invasive species management. There is also a multitude of separate and/or overlapping state, regional and local government policies, strategies, risk analyses, declarations, listings, and funding arrangements for addressing listed or defined invasive plants, animals and pathogens.[133]

It would be impossible, in the limited scope of this chapter, to address the strengths and weaknesses of, and interactions between, these many components of invasive species law, policy and governance. Instead, the remainder of this section provides a broad overview of the relevant legal frameworks, as background to a discussion on implementing the non-climatic stressors adaptation strategy in Australian biosecurity and invasive species law.

The Commonwealth government provides a 'first line of defence' for preventing the importation of invasive pests that may threaten native ecosystems, habitats or species in Australia. The *Biosecurity Act 2015* (Cth) takes a risk-based approach biosecurity regulation, focusing on areas of the highest risk of non-compliance where the consequences of failure are most significant.[134] This risk-based approach includes assessing the risk of imports, including by conducting import risk analyses, inspections and certification procedures,[135] and taking take biosecurity measures if a risk to the Australian environment is deemed unacceptable. Biosecurity measures may include moving a plant, animal or pest to a particular place, removing it from Australia, or destroying it.[136] Alternatively, the Commonwealth government may declare, in some circumstances, that an animal, plant or pest is a 'prohibited good' that cannot be imported into Australia at any

[133] Senate Environment and Communications References Committee, Parliament of Australia, *Environmental Biosecurity* (2015) 5-22.
[134] Ibid [5.130]; Beale et al, *One biosecurity: a working partnership* (Independent review of Australia's quarantine and biosecurity arrangements, final report to the Commonwealth Minister for Agriculture, Fisheries and Forestry, 2008).
[135] *Biosecurity Act 2015* (Cth) Ch 3, Pt 2, 'Biosecurity Risk Import Analyses'.
[136] *Biosecurity Act 2015* (Cth) Ch 3, Div 5.

time.[137] Enforcement mechanisms for breaches of the *Biosecurity Act 2015* (Cth) include civil penalties, infringement notices and injunctions.[138]

The Commonwealth government also collaborates with state and territory governments to eradicate and control ‘emerging biosecurity risks’. Emerging risks may arise when an invasive species already established in Australia moves to a new part of the country, causing an ‘outbreak’, and that outbreak has the potential to cause harm to ecosystems, habitat or species.[139]

Complex state and territory biosecurity and quarantine laws cover both restrictions on introducing new invasive animals, plants and pathogens and on eradicating and controlling established invasive species.[140] For example, the Tasmanian government currently administers seven separate statutes relevant to invasive species management.[141] Common themes in state legislation include prohibitions on importing, introducing, keeping and selling listed or declared weed species, and listed or recognised vermin or pest fauna.[142] Plant or animal species may be declared ‘weeds’ or ‘pest animals’ in a specified area or across a whole state.[143]

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[137] This declaration can only be made where the Director of Biosecurity and the Director of Human Biosecurity are both satisfied that: (a) the level of biosecurity risk associated with the goods, or the class of goods, is unacceptable; and (b) that biosecurity measures would not be able to be taken to reduce that level of biosecurity risk to an acceptable level, *Biosecurity Act 2015* (Cth) s 173(3).

[138] *Biosecurity Act 2015* (Cth) Ch 9, Pts 6-9.

[139] *Biosecurity Act 2015* (Cth) s 310, the Act makes specific provision in Ch 6: ‘Managing biosecurity risks: monitoring, control and response’ for Commonwealth involvement in managing ‘post-border’ biosecurity risks to the environment, to meet Australia’s international obligations to address invasive species.

[140] Eg *Biosecurity and Agriculture Management Act 2007* (WA), *Plant Biosecurity Act 2010* (Vic); note, this is an area of law that is being updated across the country, eg new legislation in Qld: *Biosecurity Act 2014* (Qld) and WA: *Biosecurity and Agriculture Management Act 2007* (WA) (entered into force in 2013); reviews currently underway in Tasmania and NSW.

[141] *Plant Quarantine Act 1997, Animal Health Act 1995, Seeds Act 1985, Weed Management Act 1999, Vermin Control Act 2000, Animal (Brands and Movement) Act 1984,* and *Animal Farming (Registration) Act 1994,* although a draft Biosecurity Bill 2017 has been released for public comment, which proposes to draw all of these elements together in a single piece of ‘framework’ legislation.

[142] Eg *Catchment and Land Protection Act 1994* (Vic) Pt 8 Div 3; in some limited cases, a permit may be granted for some of these activities eg ‘unless authorised for an approved purpose’ under the *Vermin Control Act 2000* (Tas); *Weed Management Act 1999* (Tas) ss 29, 33; *Catchment and Land Protection Act 1994* (Vic) s 77.

[143] *Weed Management Act 1999* (Tas); in Victoria, *Catchment and Land Protection Act 1994* (Vic) Pt 8 includes state and regionally prohibited weeds, restricted weeds, regionally controlled weeds (together, ‘noxious weeds’), and prohibited, controlled, regulated and established pest animals but essentially cover the state or part thereof, s 58.

Some regional and many local governments also administer weed and feral animal laws, for example, locally 'declared weeds' can be the subject of development conditions under local planning schemes.[144]

Some conservation laws also create mechanisms for managing the effect of invasive species on listed, native threatened species and ecological communities. For example, the EPBC Act provides that the Minister must prepare a threat abatement plan for listed 'Key Threatening Processes', provided such a plan is a 'feasible, effective and efficient way to abate the process'.[145] This chapter does not investigate the key threatening process mechanism, focusing instead on invasive species as a stressor for biodiversity more generally – including for non-threatened biodiversity.[146]

7.4.2 Challenges for responding to invasive species as a biodiversity stressor

The Australian *State of the Environment 2016* report was pessimistic about progress on eradicating and controlling invasive species in Australia. The report highlighted an ongoing failure to reduce the effect of existing biodiversity threats, finding that most stressors identified in earlier reports continue to exert a 'high to very high pressure on biodiversity, and are worsening'.[147] Five of the 13 listed stressors received the poorest possible assessment: having a 'very high impact', with 'a large proportion of species and/or ecosystems suffering substantial adverse effects',[148] and evidence of a recent 'deteriorating' trend.[149] No stressor was assessed as having a 'very low impact' or an

[144] Local governments play a variable role across the country but see, eg 'declared weeds' list maintained under the *Kingborough interim planning scheme 2015*.
[145] Eg EPBC Act ss 183, 270A.
[146] For commentary on Key Threatening Processes in conservation law at Commonwealth and state scales, see Riley, above n 129; Riley S, 'Law is order and good law is good order' (2012) 29(16) *Environmental and Planning Law Journal* 28.
[147] SotE 2016, above n 1, 8.
[148] Including the effect of terrestrial and aquatic invasive species, altered fire regimes on biodiversity, and the effect of global climate change on Australia's aquatic systems; four more pressures were assessed as 'high impact' – with a "significant proportion… suffering substantial adverse effects" – and a 'deteriorating' trend, SotE 2016, above n 1, 39-41.
[149] SotE 2016, above n 1, 39-41.

'improving' trend.[150] In 2011, invasive species management was the only measure rated as both ineffective and in decline:

> Most jurisdictions admit that they are unable to provide sufficient resources to control existing invasive species and most now focus on preventing establishment of new invasive species. New pressures are emerging and are of high concern due to the limited resources available for control.[151]

By 2016, the report rated management as ineffective but stable, overall, although the report notes that for the 'vast majority' of invasive species, management is ineffective and the trend is worsening.[152] At the same time, 'inputs', which include resourcing for management, were ranked as ineffective and deteriorating.[153] Both the 2016 and 2011 reports deemed management at the state level to be ineffective in most cases, based on evidence that the impact of invasive species on native biodiversity was getting worse.[154]

Australia's national biodiversity strategy sets an interim target to '…reduce by at least 10% the impacts of invasive species on threatened species and ecological communities in terrestrial, aquatic and marine environments' by 2015.[155] However, a recent review found 'little or no progress towards achieving this target'.[156] The reported cited a range of reasons for that failure, including weaknesses in arrangements for environmental biosecurity and an ongoing lack of coordination in invasive species management between the Commonwealth, states and territories, regions and local government.[157] Other challenges

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[150] Ibid.
[151] SotE 2011, above n 14, 667.
[152] SotE 2016, above n 1.
[153] SotE 2016, above n 1; Senate Committee, above n 133, 26-33.
[154] SotE 2011, above n 14, 665; eg in 2011 Victoria had 'half as many exotic plant species as there are native plant species, and every year another ten weeds or other exotic plants are established', ISC and Victorian National Parks Association ('VNPA'), *Response by the Invasive Species Council and Victorian National Parks Association to the discussion paper on an Invasive Species Management Act* (2011); Martin et al, above n 124.
[155] Australian Natural Resource Management Ministerial Council, *Australia's Biodiversity Conservation Strategy 2010-2030* (2010) ('Biodiversity Conservation Strategy') 14, 'interim national target 7', intended to be achieved in the first five years of the strategy's operation.
[156] Humane Society International ('HSI'), *Australia's Biodiversity Conservation Strategy 2010-2030: an independent review of progress* (2015) 5, 33-36.
[157] Ibid 33-36; Invasive Species Council, 'Stopping new invasive species: primary submission', submission to the Senate Environment and Communications References Committee, *Inquiry into the adequacy of arrangements to prevent the entry and establishment of invasive species likely to harm Australia's natural environment* (September 2014); Burgman, M et al, 'Designing regulation for conservation and biosecurity' (2009) 13 *Australasian Journal of Natural Resources Law and Policy* 93.

for addressing the threat of invasive species to Australian biodiversity include insufficient information and resourcing,[158] and ad hoc and reactive approaches to listing weeds for biosecurity control.[159]

Governance failures also hinder efforts to address the impact of invasive species on biodiversity in Australia. Governance failures include an ongoing lack of coordination between states and with the Commonwealth;[160] and limited precautionary, strategic approaches to species that pose a threat to the environment.[161] In addition, in every Australian jurisdiction, departments of agriculture or primary industries administer laws for invasive species management and control, rather than conservation agencies.[162] While some specific biosecurity branches are responsible for both industrial and environmental invasive species, poor legal and policy implementation and resourcing for those species that affect only native biodiversity, almost certainly reflect departmental priorities.[163]

Addressing these challenges will be critical to reducing the vulnerability of Australia's species and ecosystems, and enhancing their adaptive capacity in the face of climate change. The remainder of Section 7.4 recommends reforms to achieve this end.

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[158] Eg Martin, R, 'The law and economics of feral extermination: legal and economic answers to eradicating the cane toad' (2015) 32 *Environmental and Planning Law Journal* 115; Invasive Species Council, 'Submission', submission on the *Discussion paper on modernising Australia's approach to established pests and diseases of national significance* (31 July 2015).
[159] Eg Invasive Species Council, 'Stopping new invasive species: primary submission', submission to the Senate Environment and Communications References Committee, *Inquiry into the adequacy of arrangements to prevent the entry and establishment of invasive species likely to harm Australia's natural environment* (September 2014); Martin, Paul et al, 'Innovations in institutions to improve weed funding, strategy and outcomes' (Rural Industries Research and Development Cooperation, 2012).
[160] Riley, above n 129, 77; noting, in the context of freshwater fishes, that the different lists of prohibited species across different jurisdictions means that a species prohibited in one jurisdiction may be permitted in a neighbouring state, undermining efforts by regulators to manage and plan for the risk of cross-border movement. This applies equally to other forms of invasive alien species, including terrestrial species of plants and animals; Beale et al, above n 134; Cox, above n 159.
[161] Eg Burgman et al, above n 157.
[162] Eg Commonwealth Department of Agriculture and Water Resources; Queensland Department of Agriculture and Fisheries; Agriculture Victoria; South Australian Department of Primary Industries and Regions; Senate Committee, above n 133, on funding, management and agency priorities for agricultural *cf* environmental biosecurity.
[163] Including key appointments, such as the Inspector-General of Biosecurity (an independent statutory office created under the *Biosecurity Act 2015* (Cth) to review the functions and processes of Commonwealth biosecurity officials) is appointed by the Minister for Agriculture and Water Resources; while not suggesting the Inspector-General's appointment is tainted, this highlights the agricultural, rather than conservation, focus of invasive species governance.

7.4.3 Recommendation 1: take proactive approaches to invasive species

An ongoing failure to properly value biodiversity and its interactions and components,[164] particularly when balanced against the more readily measured and costed impacts of invasive species on agriculture, has been a feature of invasive species management in Australia for two centuries.[165] This failure is epitomised in the reactive, ineffective approach of most states and territories to statutory lists of invasive plants, and in the prevalence of negative obligations on landholders. This section also argues that a major emerging challenge for existing laws and future decision makers that has received limited attention to date, is the need for guidance on responding effectively to *native* invasive species.

(a) Replace reactive 'black lists' with a 'white' or 'grey list' approach

Most Australian states and territories maintain a reactive, 'black list' approach to invasive plant species, under which legislative controls on introduction, movement, possession and propagation are triggered when a plant is added to a statutory list of recognised weeds. This approach has been criticised as slow, bureaucratic, and as achieving 'bans on species that have already established, and often long after it is too late to eradicate them'.[166] 'White lists' or permitted lists prohibit movement of non-native species unless explicitly allowed, and have already been implemented at the Commonwealth level and in Western Australia.[167] Combined with black lists for particularly harmful or 'high-risk' species[168] – that is, a 'grey' list approach – would promote a proactive and precautionary approach to

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[164] Martin, above n 158; Senate Committee, above n 133, 26-29.
[165] Riley, above n 146, 35, noting that this is a 'state of affairs that is not helped by the lack of a national [Invasive Alien Species] strategy and the perfunctory treatment given to IAS by the EPBC Act'.
[166] ISC 2009b, above n 126, 5, noting that the black list approach could technically allow proactive listings but this has only occurred occasionally and 'on an ad hoc basis rather than systematically'.
[167] Riley, above n 129, 84-86; ISC 2009b, above n 126; Keller, Reuben P, David M Lodge and David C Finnoff, 'Risk assessment for invasive species produces net bioeconomic benefits' (2007) 104 *Proceedings of the National Academy of Sciences* (*of the United States*) (*PNAH*) 203, on reactive laws rather than 'defensive' of ecosystems.
[168] Which could apply to species that, for example, fail a weed risk assessment or which are controlled in particular areas due to a particular ecological vulnerability or sensitivity, ISC 2009b, above n 126, 4, and to 'future invasive species threats', in line with the 'national priority list of pests and diseases not yet established in Australia that are of environmental biosecurity concern'; Senate Committee, above n 133, recommendation 9; blacklisted species would still be the subject of absolute prohibitions for introduction and possession, with more severe penalties for a breach, ISC 2009b, above n 126, 1-2.

the potential spread of invasive species, and should be implemented in every jurisdiction to reduce the risk of invasive species being introduced across borders.[169] To increase efficiency and streamline assessment processes, a listing in one state should automatically update lists in every other state.[170] This would have the additional climate adaptation benefit of ensuring that, for example, a species with weed status in northern Queensland in 2017, which may become invasive in Victoria or Tasmania under future climate change scenarios, is identified early and its introduction prohibited before it becomes a risk.

(b) Proactive obligations to eradicate new invasive species and positive obligations on property owners

Obligations to manage invasive species are usually expressed as negative obligations, including prohibitions on acquiring listed weeds or releasing feral animals. These obligations provide a clear example of the reactive approach to most Australian environmental and resources laws: to 'avoid causing further harm'. However, in some jurisdictions, landholders are subject to positive obligations. For example, in Victoria, landowners in declared 'priority areas' for weeds or pest animals may be served with a notice listing measures that they must take to control or eradicate certain identified species in that area.[171] It is an offence to fail to comply with a notice.[172] These positive obligations do not currently extend to achieving good conservation outcomes, promoting ecosystem health, facilitating landscape-scale connectivity or reversing biodiversity losses.

To improve opportunities to achieve environmental 'gains' rather than simply preventing further environmental loss, positive statutory obligations could be imposed on landholders to actively remedy any exacerbation of the challenge of invasive species for biodiversity.[173] Positive obligations may include levying a bond from a person that undertakes a new activity with the risk of creating a future need for eradication or control;

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[169] ISC 2009b, above n 126.
[170] Consistent with – but automatic rather than negotiated – Allan Hawke's recommendation that states and territories develop criteria and management protocols for the movement between jurisdictions of a negotiated list of 'controlled' exotic and potentially harmful species, Hawke, above n 94, 149. Species added automatically could be removed from a state's list if, for example, there was a compelling, scientifically-supported reason, in the public interest.
[171] *Catchment and Land Protection Act 1994* (Vic) s 47A.
[172] *Catchment and Land Protection Act 1994* (Vic) s 47D.
[173] Including to achieve goals such as conserving 'indigenous ecological processes' under invasive species laws, eg *Weed Management Act 1999* (Tas) s 9(1)(a)(iii)-(v).

or imposing a general ‘duty of care’ on landowners or leaseholders to act responsibly and remedy damage arising from any act that introduces or perpetuates the spread of an invasive species.[174] The *Biosecurity Act 2014* (Qld) imposes a ‘general biosecurity obligation’ that is along these lines, requiring that any person undertaking an activity that they know or ought reasonably to know is likely to pose a biosecurity risk, must take ‘all reasonable and practical measures to prevent or minimise’ that risk. This includes an obligation *not to omit to do something* if the omission would exacerbate the activity’s adverse effect on a biosecurity consideration,[175] such as ‘failing to manage the impact of invasive plants and animals on a person’s land’.[176]

(c) Challenges for managing invasive endangered species and invasive native species

An issue that requires greater consideration is the appropriate approach to managing non-native species that are endangered or extinct in their indigenous range. If the last population of a non-native species is an invasive species in Australia, and its eradication would result in the species’ global extinction, Australian governments may need to accept a conservation role.[177] This may arise in future, for example, for species such as the Banteng (*Bos javanicus*), a species of wild cattle that is managed as invasive in Northern Australia but is genetically identical to wild, endangered populations in the species’ home range in South East Asia.[178]

Public and private land managers will need guidance for responding as species – including well-recognised Australian native species – arrive in an area for the first time, and new ecological interactions become apparent. For example, new- or neo-native species – ‘species that migrate to an area outside their historical range but still within the State or

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[174] See ISC and VNPA, above n 154, 5-6; Bates, Gerry, *A duty of care for the protection of biodiversity on land* (Consultancy report to the Productivity Commission, 2001).
[175] *Biosecurity Act 2014* (Qld) s 23(3)(c), ch 2 generally.
[176] *Biosecurity Act 2014* (Qld) s 23(3)(c), ‘examples’; a similar duty is imposed in the *Biosecurity Act 2015* (NSW).
[177] Marchetti, MP and T Engstrom, ‘The conservation paradox of endangered and invasive species’ (2016) 30(2) *Conserv Biol* 434.
[178] Ibid; Bradshaw CJ et al, ‘Conservation value of non-native banteng in northern Australia’ (2006) 20(4) *Conserv. Biol*. 1306; Brook, BW et al, ‘Managing an endangered Asian bovid in an Australian national park: the role and limitations of ecological-economic models in decision-making’ (2006) 38(3) *Environ Manage* 463.

country to which they are native'[179] – may be categorised as invasive, benign or endangered in their original habitat, and may qualify for the same category, or a different category, as they migrate into new environments.[180] The novel ecosystems that will emerge as species' ranges shift or contract to refugia may exhibit different responses to management, including greater susceptibility to bushfire, rapid increases in predation by feral predators and faster weed invasions, or new and unexpected feedbacks between biodiversity stressors and management responses.

The dichotomy between native conservation and non-native control in legal frameworks will complicate responses to native invasive species.[181] Laws and policies should be reformed in anticipation of these challenges, supporting decision makers to make complex decisions about novel ecological interactions, often on a case-by-case basis.[182] Dunlop and colleagues have recommended that policy makers 'develop concepts and guidelines to accommodate rapidly spreading native species and help managers decide when these are desirable or undesirable due to their impact on other resident species'.[183] This 'proactivity' legal design principle could support efforts by legislators and policy makers in anticipation of difficult invasive/native cases arising.

7.4.4 Recommendation 2: cat management laws and triage

The most urgent invasive species threats to biodiversity should be the subject of greater investment and regulatory attention, including at the regional and local government scales where stricter regulatory control may make inroads. This recommendation uses predation

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[179] McCormack, Phillipa and Jan McDonald, 'Adaptation strategies for biodiversity conservation: has Australian law got what it takes?' (2014) 31 *Environmental and Planning Law Journal* 114; the term 'non-native' has also been used to describe a species that is not native but with some positive characteristics and an established ecological role in its new range: Rogalski M and Skelly D, 'Positive effects of nonnative invasive Phragmites Australis on larval bullfrogs' (2012) 7(8) *PLoS ONE* e44420.
[180] Scott, Daniel and Christopher Lemieux, 'Climate change and protected area policy and planning in Canada' (2005) 81(5) *The Forestry Chronicle* 696, 698-699; conversely efforts to unify threatened species and communities listing processes across Australian governments may create some challenges for local or regional-specific management needs, particularly if listed threatened species from one jurisdiction demonstrate invasive characteristics in another.
[181] McCormack and McDonald, above n 179; Marchetti and Engstrom, above n 177.
[182] Craig, Robin Kundis, 'The Clean Water Act, climate change, and energy production: a call for principled flexibility regarding "existing uses"' (2013) 4(2) *George Washington Journal of Energy & Environmental Law* 26; Dunlop, M and PR Brown, *Implications of climate change for Australia's National Reserve System* (A preliminary assessment report to the Commonwealth Department of Climate Change, 2008) 97.
[183] Dunlop, Michael et al, *Implications for policymakers: climate change, biodiversity conservation and the National Reserve System* (CSIRO Climate Adaptation Flagship, 2012) 8.

by domestic and feral cats as an example, because cats are the most destructive invasive species for biodiversity in Australia.[184] While complete eradication of feral cats is currently unachievable on mainland Australia, local government bylaws and planning schemes could reduce the effect of domestic and stray cat predation on local wildlife.[185]

Many local governments in Australia have implemented controls on domestic, roaming and stray cats, including compulsory curfews, 24-hour containment and neutering programs.[186] Compliance and enforcement has sometimes been low, but may be improved by introducing trap-neuter-release programs[187] or time limits such as a seven-day ‘holding period’ at a cat home for captured stray and domestic cats before they are humanely euthanased.[188] Many local governments still have limited or no controls on cat management, despite consistent national controls on roaming dogs, which have a dramatically lower impact on biodiversity.[189] The controls listed above should be implemented nationwide as a baseline for cat management.

However, local governments should be encouraged to be more ambitious, implementing ‘cat free zones’ in planning schemes or through restrictive covenants registered on title for new subdivisions and housing developments, especially those located close to intact remnant vegetation or protected areas.[190] These reforms could be supplemented by data gathering obligations for councils or regional bodies, feeding into a centralised, accessible national database about biodiversity values and cat controls – to support informed and optimised cat management in the future.[191] These approaches will need to take into account

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[184] Woinarski, Burbidge and Harrison, above n 3; and internationally, Doherty, above n 125.
[185] Eg monitoring data identified ‘significant predation risks’ to native fauna in the ACT by domestic cats, Eyles K and M Mulvaney, *Background paper: options for improving the management of cats in the ACT* (Invasive Animals CRC, nd) 5.
[186] Ibid 12, 30; Victoria and the ACT limit control mechanisms to minimising harm to native threatened fauna; NSW has additional by-law powers to declare curfews; NT regulation is limited to cats roaming ‘at large’; in WA and Tasmania, local governments can make by-laws to manage cats, including prohibiting them, proposal for Bruny Island in Kingborough City Council area, <http://www.kingborough.tas.gov.au/page.aspx?u=779>.
[187] Mitigates community concerns about cat euthanasia and can contribute to a reduction in cat populations over time if implemented effectively, Slater M and S Shain ‘Feral cats: an overview’ in DJ Salem and AN Rowan (eds) *The state of the animals III* (Humane Society Press, 2005) 43.
[188] *Animal Welfare Act* (NZ) provides that feral and stray cats can be put down unless there is evidence (for stray cats) of ownership, in which case the cat must be sent to a shelter for at least seven days.
[189] Interviews #15 (research); #26 (government).
[190] Eyles and Mulvaney, above n 185.
[191] Walsh, JC et al, ‘Unexpected outcomes of invasive predator control: the importance of evaluating conservation management actions’ (2012) 15(4) *Animal Conservation* 319.

animal welfare concerns, and may require state legislation and/or clear policy support to ensure that local government decision making has support in case of legal appeals.[192]

Domestic cats have been excluded from new developments in some local government areas, including in south west Melbourne[193] and south of Sydney,[194] but implementation has been undermined by a lack of education and enforcement.[195] Education and engagement are key to the effectiveness of such measures, and benefit from community liaison roles in local government to catalyse support across diverse groups such as farmers and residents with conservation covenants.[196] As noted above, enforcement will be crucial to reducing the effect of cat predation on wildlife and could be funded by cat registration and micro-chipping fees.

In addition to these reforms, and to supplement the gains made for conservation in predator-proof fenced areas,[197] state legislation and local government by-laws should direct special effort to establishing cat-free zones and cat eradication obligations on offshore islands, where some of the world's most vulnerable biodiversity occurs[198] and which may play an increasingly crucial role in conservation efforts under climate change.[199] For example, state governments could declare all publically-owned, offshore islands larger than a defined size, whether or not they have human settlements, cat-free. Island eradication projects for invasive species have been demonstrated to be achievable and to

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[192] #26 (local), #34 (local) *cf* #22 (state); *Biosecurity Act 2014* (Qld) ch 3 provides local governments in that state with legislative support to enforce management activities for high-priority invasive species, and directs funding under a Land Protection Fund to help local governments manage invasive species, ss 56-59.

[193] Botanic Ridge and Settler's Run settlements in the City of Casey are 'cat free zones' because of their proximity to the Royal Botanic Gardens Cranbourne and a population of endangered brown bandicoots, implemented through a 'Section 173 Agreement' registered on each property's title under the *Planning and Environment Act 1987* (Vic) s 173.

[194] The Shoalhaven local council in NSW also prohibited cats from a new residential development in the coastal town of Vincentia using an instrument registered on title, Environmental Resources Management ('ERM'), *Vincentia Costal Village and District Centre Feral and Domestic Animal Plan* (Prepared for Stockland Developments Pty Ltd, 2008), cited in Eyles and Mulvaney, above n 185.

[195] Eg City of Casey installed signage 11 years after a ban was imposed in that local government area, <http://www.casey.vic.gov.au/council/news-publications/mediareleases/catfree6aug15>; Eyles and Mulvaney, above n 185, 5.

[196] Interview #26 (local).

[197] Interview #15 (research), '…absolutely the minute you fence [invasive predators] out, all of a sudden miraculous things happen'; Short, Jeff, *Australian Animal Welfare Strategy: the characteristics and success of vertebrate translocations within Australia* (Commonwealth Department of Agriculture, Fisheries and Forestry, 2009).

[198] Doherty et al, above n 125.

[199] Eradicating cats from offshore islands is one of the goals of the Commonwealth Department of the Environment and Energy, *Threat abatement plan for predation by feral cats* (2008).

enable ecosystem restoration projects. Where appropriate, such eradications may also support conservation introductions, including of threatened or keystone species that are subject to insurmountable pressures in their native habitat.[200]

7.4.5 Recommendation 3: prioritise adaptive management

The fragmented nature of invasive species laws and policies – which typically target individual species rather than multiple, interacting threats – render adaptive management a particularly crucial consideration for addressing this non-climatic stressor.[201] As climate change triggers changes at local and bioregional scales, including through species redistributions, extinctions, and changing ecological interactions,[202] legal frameworks to reduce non-climatic threats to biodiversity must incorporate strategic and collaborative approaches, including across jurisdictional boundaries and threatening processes. Achieving integrated approaches will be impossible without clear goals and investment priorities; tools for assessing failure or progress on those goals; and a commitment to changing or abandoning management techniques, investments and priorities if necessary, based on the results of monitoring and learning over time.

These components of effective adaptive management are also critical for identifying whether an intervention is having unintended effects, including for other species and ecosystem-scale climate adaptation, or interacting with other components of a conservation management regime to improve, exacerbate, influence or change the nature of the task at hand. As noted elsewhere in this thesis, effective adaptive management depends on clear, overarching legal goals and objects clauses, as well as specific, measurable objectives in statutory instruments and management plans.

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[200] Chapter 8; Towns, DR, CJ West and KG Broome, ‘Purposes, outcomes and challenges of eradicating invasive mammals from New Zealand islands: an historical perspective’ (2013) 40(2) *Wildlife Research* 94].
[201] Eg statutory obligations to remove weeds are not required to be implemented in conjunction with feral animal control or fire management, despite growing evidence of complex interactions between them, Doherty, Tim S. et al, ‘Multiple threats, or multiplying the threats? Interactions between invasive predators and other ecological disturbances’ (2015) 190 *Biological Conservation* 60.
[202] Dunlop and Brown, above n 182.

7.5 Conclusion

This chapter demonstrated the importance and urgency of reducing existing stressors to avoid the increasingly complex and ‘wicked’ interactions that will develop between non-climatic stressors and climate change, highlighted key failures in current approaches, and identified remedial opportunities for implementing and enforcing existing laws. While laws and policies for both land clearing and invasive species have existed for many decades, their implementation and enforcement have been patchy at best, rarely strategic and in the case of land clearing, particularly worryingly, are currently being unwound in a number of jurisdictions. Nevertheless, reducing the effects of these stressors on biodiversity should be achievable, given Australia’s status as a developed, wealthy country.

The non-climatic biodiversity stressors of land and habitat clearing and invasive species interact with each other, and with other stressors such as drought and over-extraction of water, pollution, and increasingly, with climate change. Effective implementation of the adaptation strategy to reduce the effect of non-climatic stressors on biodiversity will require integrated responses at every governance scale and in every jurisdiction. Strong legal frameworks to reduce vegetation clearing should operate alongside invasive species eradication and control efforts in coordinated Commonwealth, state and local government laws.[203] However, even the most effective implementation of this strategy – such as completely removing an ecological stressor – may not be able to revert ecosystems to historical ‘types’ if ecological interactions have been fundamentally interrupted, especially as environmental and ecological contexts shift with climate change.[204]

To reduce biodiversity vulnerability under climate change and promote adaptive capacity, the efforts discussed in both Section 7.3 and 7.4 of this chapter should operate in parallel with strategies to reduce fragmentation and expand the protected area estate,[205] and new

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[203] Multiple approaches to biodiversity decline should be explored/implemented together, Lindenmayer, DB ‘Continental-level biodiversity collapse’ (2015) 112(15) *Proceedings of the National Academy of Science U S A* 4514.
[204] Hobbs and colleagues this challenge as a ‘legacy of system change’, that fundamentally changes ecological interactions, Hobbs, R et al, ‘Novel ecosystems: theoretical and management aspects of the new ecological world order’ (2006) 15(1) *Global Ecology and Biogeography* 1, 3.
[205] Chapter 5.

approaches including identifying and conserving climate refugia and, where appropriate, facilitating conservation introductions.[206] Adaptation-oriented laws for non-climatic stressors will also require attention to particular instances, contexts and challenges at individual sites. The role of law in such cases may simply be facilitative, such as setting climate-ready statutory objects; ensuring that agencies commit appropriate resources to achieving adaptation-oriented project goals; and ensuring that decision makers have the necessary authority and clarity of purpose to implement activities that are identified as critical for biodiversity adaptation.

This chapter contributes to growing calls for a renewed commitment – at all scales of government and across the broader community – to reducing the effect of these non-climatic stressors on biodiversity. This adaptation strategy is an essential, no-regrets pre-condition for improving the capacity of Australia's plants and animals to adapt and survive as they face the unprecedented challenges of climate change. The next chapter investigates a particularly challenging context for applying these integrated approaches, where the adaptation strategy of introducing species and ecological assemblages outside their 'natural distributions' will often directly conflict with long-established legal goals and objects that prioritise preservation and stationarity.

[206] Chapter 8.

Chapter 8 Improve the use of *ex situ* conservation: conservation introductions

Parts of this chapter are published in Phillipa C McCormack, 'Conservation introductions for biodiversity adaptation under climate change' (2018) (first view online) *Transnational Environmental Law* 1. Permission has been granted from the Editors-in-Chief to reproduce sections of this article in this chapter.

8.1 Introduction

This thesis uses the adaptation strategies most commonly advocated in scientific scholarship as a lens for analysing the key research question, which is: *How can Australia's legal frameworks for biodiversity conservation facilitate adaptation as the climate changes*. The three preceding chapters (Chapters 5, 6 and 7), analysed Australia's legal frameworks for implementing the first three strategies, which are: expanding and enhancing the protected area estate,[1] improving landscape-scale connectivity[2] and reducing non-climatic stressors on biodiversity.[3] Each of those chapters demonstrated that existing laws and policies can support implementing those strategies, at least in part, but law reform will be necessary to improve their implementation for biodiversity adaptation.

Chapter 8 is the final chapter to investigate implementation of an adaptation strategy in detail. It analyses law and policy for implementing the '*ex situ* strategy', which targets biodiversity with low adaptive capacity, high vulnerability and high exposure to climate change.[4] Biodiversity conserved '*ex situ*' is conserved in a location other than where it is defined as native and has historically been distributed (its 'historical distribution'). These characteristics render the *ex situ* strategy more resource-intensive, risky and controversial and, as such, the 'highest-intensity' form of intervention in the spectrum of adaptation interventions.[5] The *ex situ* strategy emphasises a growing need to improve the use of multiple *ex situ* conservation interventions for adaptation; with a particular focus in this

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[1] Chapters 5, 6.
[2] Chapters 5, 6, 7.
[3] Chapter 7.
[4] Chapter 3, Section 3.3 ('spectrum of adaptation strategies'); research interviews did not address this strategy specifically so interview data are not included in the analysis in this Chapter; research approach, Chapter 2, Section 2.4.4.
[5] Chapter 3, Section 3.3.

thesis on conservation introductions.[6] Conservation introductions involve introducing species, ecological communities or ecosystem components outside their historical distribution, usually with the intention of creating new, self-sustaining *ex situ* populations.[7] This chapter demonstrates that conservation introductions are an increasingly important adaptation-oriented conservation response, but particularly poorly expressed in existing legal frameworks for facilitating biodiversity adaptation.

Climate projections indicate that many species' ranges will shift in response to rapid, large-scale climate change, triggering changes in the combination of species at any given location ('species assemblages').[8] Species that are unable to independently adapt their behaviours or distributions in time may not be able to survive within their existing ranges, particularly as extreme events such as bushfires, coastal inundation and heatwaves become more common and more severe.[9] However, suitable habitats for long-term conservation '*in situ*' may not be available for long within the boundaries of a species' historical distribution. Indeed, suitable habitats may no longer occur within the political jurisdiction in which a species is considered native.[10] More proactive and controversial human

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[6] Chapter 2, Section 2.4.1.
[7] Chapter 3, Section 3.3.4.
[8] IPCC, 'Summary for policymakers' in CB Field et al (eds), *Climate Change 2014: Impacts, Adaptation and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the fifth assessment report of the IPCC* (Cambridge University Press, 2014) 4; Urban MC, JJ Tewksbury and KS Sheldon, 'On a collision course: competition and dispersal differences create no-analogue communities and cause extinctions during climate change' (2012) 279(1735) *Proceedings of the Royal Society of London B: Biological Sciences* 2072; Thomas CD et al, 'Extinction risk from climate change' (2004) 427(6970) *Nature* 145, 147; Cahill AE et al, 'How does climate change cause extinction?' (2013) 280(1750) *Proceedings of the Royal Society B: Biological Sciences* 1; Pecl GT et al, 'Biodiversity redistribution under climate change: impacts on ecosystems and human well-being' (2017) 355(6332) *Science* 92141; Hobbs RJ et al, 'Novel ecosystems: theoretical and management aspects of the new ecological world order' (2006) 15(1) *Global Ecology and Biogeography* 1, 1.
[9] Willis SG et al, 'Assisted colonization in a changing climate: a test-study using two U.K. butterflies' (2009) 2(1) *Conservation Letters* 46, 49; Schloss CA, TA Nuñez and JJ Lawler, 'Dispersal will limit ability of mammals to track climate change in the western hemisphere' (2012) 109(22) *Proceedings of the National Academy of Sciences* 8606; Settele J et al, 'Terrestrial and inland water systems', in CB Field et al (eds) *Climate Change 2014: Impacts, Adaptation, and Vulnerability Part A*, WGII 5AR (Cambridge University Press, 2014) 271, 275.
[10] Dunlop, Michael et al, *The implications of climate change for biodiversity conservation and the National Reserve System: final synthesis* (Report prepared for the Australian Government, CSIRO Climate Adaptation Flagship, 2012) 21-2; O'Sullivan OS et al, 'Thermal limits of leaf metabolism across biomes' (2017) 23(1) *Global Change Biology* 209.

interventions, including conservation introductions, are likely to become increasingly important as an adaptation response to this challenge.[11]

This chapter explores emerging legal and policy challenges to using conservation introductions to facilitate biodiversity adaptation. The chapter proceeds in four parts. Section 8.2 briefly summarises recent scholarship on conservation introductions, explaining why they will become more important, particularly in Australia, for conserving biodiversity as the climate changes. Section 8.3 provides an analysis of Australia's existing legal and policy framework for conservation introductions.[12] It finds little acknowledgment in existing law of the growing need to engage in proactive strategies such as conservation introductions, or to collaborate across political borders to address the effects of climate change.

Section 8.4 identifies important reforms to support a more adaptation-oriented approach to conservation introductions under climate change.[13] As in preceding chapters, Section 8.4 begins with recommendations for integrating conservation introductions with landscape and continental-scale connectivity projects to enhance biodiversity adaptation outcomes from both.[14] Section 8.4 then applies the legal design principles from Chapter 4 to the legal framework for conservation introductions. It evaluates the potential for new legal mechanisms to facilitate proactive and collaborative conservation introductions, supported by appropriate accountability mechanisms and prioritised adaptive management.
Section 8.5 concludes with a call for greater engagement across national and sub-national borders, supported by conservation laws that seek to conserve nature, regardless of where it is located.

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[11] Eg Hoegh-Guldberg O et al, 'Assisted colonization and rapid climate change' (2008) 321(5887) *Science* 345-6.
[12] To answer research question (RQ) III: *To what extent are these strategies currently represented in Australia's legal frameworks for conservation?* and RQIV: *To what extent do Australian legal frameworks for conservation hinder or promote the effective implementation of these strategies?*
[13] To answer RQV: *How can Australian law be reformed to improve the representation and implementation of these strategies?*
[14] Chapter 2, Section 2.4.1, justification for integrating the connectivity strategy in this way.

8.2 Conservation introductions as a biodiversity adaptation strategy

The term 'conservation introduction' is defined by the International Union for the Conservation of Nature ('IUCN') as 'the intentional movement and release of an organism outside its indigenous range'.[15] The IUCN recognises two types of conservation introduction: assisted colonisation – referred to hereafter as 'managed relocation'[16] – and ecological replacement.[17] Managed relocation involves introducing species into new habitats, where current or future climate change will make their traditional habitats unsuitable.[18] However, not every species at risk of extinction can be the subject of such time-consuming and costly intervention. Extinctions caused by climatic changes such as sea level rise, or by compounding pressures such as wildfire and urban development, may affect key ecological functions.[19] In such cases, introducing a species – or suite of species – that is ecologically similar to extinct native species may help to restore lost ecological functions; a strategy known as 'ecological replacement'. This technique might also prevent ecosystems from crossing thresholds into new, less desirable states.[20] In this way, ecological replacements prioritise conservation benefits to the ecosystem that receives the introduction ('receiving location').[21]

Conservation introductions may need to be deployed in Australia sooner and more often than in other jurisdictions. This is, in part, because Australia has an unenviably high rate of

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[15] International Union for the Conservation of Nature/Species Survival Commission, *Guidelines for reintroductions and other conservation translocations: version 1.0* (IUCN, 2013) ('IUCN Guidelines 2013') 3.
[16] In support of calls for the culturally insensitive term 'assisted colonisation' to be abandoned, see Lee E et al, 'The language of science: essential ingredients for Indigenous participation' (2016) 10 *[square brackets]: CBD Newsletter for Civil Society* 22 <https://www.cbd.int/ngo/square-brackets/square-brackets-2016-04-en.pdf>; Schwartz MW et al, 'Managed relocation: integrating the scientific, regulatory, and ethical challenges' (2012) 62(8) *BioScience* 732.
[17] IUCN Guidelines 2013, above n 15.
[18] Ibid.
[19] Seddon, Philip J, 'From reintroduction to assisted colonization: moving along the conservation translocation spectrum' (2010) 18(6) *Restoration Ecology* 796, 799.
[20] Ibid.
[21] IUCN Guidelines 2013, above n 15; Harris S et al, 'Whose backyard? Some precautions in choosing recipient sites for assisted colonisation of Australian plants and animals' (2013) 14(2) *Ecological Management & Restoration* 106, 108-9.

historical and ongoing biodiversity decline.[22] The Australian biota is also particularly susceptible to climate change with high rates of species endemism, narrow species ranges, and limited independent dispersal capacity.[23] Australian species also face significant topographical barriers to independent adaptation including the need to travel vast distances across inhospitable terrain at a speed that is unlikely to be achievable for most species.[24]

Conservation introductions are already in use around the world, both under existing conservation law,[25] and in unregulated or unsanctioned contexts.[26] The literature on conservation introductions features often-heated ecological and ethical debates about the significant risks that these strategies pose to target species and receiving locations.[27] For example, an unsuccessful attempt to introduce a threatened species to a new habitat may exacerbate its extinction risk. Successful introductions may also create risks, illustrated by historical examples of species invasions,[28] such as the catastrophic introduction of cane toads and foxes to Australia. Broader ecological risks include the potential to interrupt healthy ecosystem functions in a receiving location. While less commonly discussed, the relative risk of failing to intervene, as species, ecological communities and ecosystems move or disappear under climate change, will become an increasingly significant factor in conservation decision making.[29]

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[22] Woinarski JCZ, AA Burbidge and PL Harrison, 'Ongoing unraveling of a continental fauna: decline and extinction of Australian mammals since European settlement' (2015) 112(15) *PNAS* 4531.
[23] Steffen, W et al, *Australia's biodiversity and climate change: a strategic assessment of the vulnerability of Australia's biodiversity to climate change* (Biodiversity and Natural Resource Management Adaptation Team, Commonwealth Department of Climate Change, 2009) 8-9, 93.
[24] Ibid 15-6; Burbidge AA et al, 'Is Australia ready for assisted colonization? Policy changes required to facilitate translocations under climate change' (2011) 17(3) *Pacific Conservation Biology* 259, 259.
[25] Eg UK: Willis et al, above n 9; NZ: Chauvenet ALM et al, 'Saving the Hihi under climate change: a case for assisted colonization' (2013) 50(6) *Journal of Applied Ecology* 1330; Australia: Short, Jeff, *Australian animal welfare strategy: the characteristics and success of vertebrate translocations within Australia* (Report to the Australian Department of Agriculture, Fisheries and Forestry, 2009) iv-vii.
[26] Section 8.4.6; eg unregulated and ongoing introductions of *Torreya taxifolia* north of its historical distribution, Torreya Guardians <http://www.torreyaguardians.org>.
[27] Eg Sandler, R, 'The value of species and the ethical foundations of assisted colonization' (2010) 24(2) *Conservation Biology* 424; Ricciardi, A and D Simberloff, 'Assisted colonization is not a viable conservation strategy' (2009) 24(5) *Trends Ecol Evol* 248.
[28] Ricciardi, Anthony and Daniel Simberloff, 'Assisted colonization: good intentions and dubious risk assessment' (2009) 24(9) *Trends in Ecology & Evolution* 476; Xu, Han et al, 'Intentionally introduced species: more easily invited than removed' (2014) 23(10) *Biodiversity and Conservation* 2637.
[29] Schwartz MW and TG Martin, 'Translocation of imperiled species under changing climates' (2013) 1286 *Annals of the New York Academy of Sciences* 15.

Conservation introductions also involve significant uncertainties, including about habitat requirements and species interactions, both within historical distributions and receiving locations.[30] Further uncertainties arise in relation to the short, medium and long-term effects of climate change on introduced populations and ecosystem functioning. This was a central concern in planning the managed relocation of the critically endangered Western Swamp Tortoise (*Psuedemydura umbrina*) in Western Australia.[31]

Legal frameworks that implicitly allow or are silent on the use of conservation introductions will be less effective at mitigating these risks and reducing these uncertainties. Clear law and policy frameworks will be necessary to support rigorous assessment and accountability mechanisms for introduction strategies, and to facilitate adaptive management.[32] However, outside the United States there has been limited analysis of the hurdles and opportunities posed by existing legal frameworks under which conservation introduction projects necessarily take place, or of the legal mechanisms that might support or promote more adaptation-focused conservation responses.[33] Domestic Australian laws and policies are also silent on how transboundary introductions of one or more species populations may need to be negotiated. This chapter contributes to the development of a legal framework that promotes such assessment, accountability and transboundary mechanisms.

8.3 Current law and policy for conservation introductions

This section sets out the international context in which domestic laws for conservation introductions have developed, then analyses the Australian federal and state/territory framework as an example of a domestic approach. It finds that domestic law and policy for conservation introductions are closely tied to threatened, native species conservation laws,

[30] Seddon, Philip J et al, 'The risks of assisted colonization' (2009) 23(4) *Conservation Biology* 788, 788.
[31] Mitchell, N et al, 'Linking eco-energetics and eco-hydrology to select sites for the assisted colonization of Australia's rarest reptile' (2013) 2(1) *Biology (Basel)* 1.
[32] Burbidge et al, above n 24.
[33] For US perspective, see Joly JL and N Fuller, 'Advising Noah: a legal analysis of assisted migration' (2009) 39(5) *Environmental Law Reporter* 10413; Camacho, Alejandro E, 'Assisted migration: redefining nature and natural resource law under climate change' (2010) 27(2) *Yale Journal on Regulation* 171; Shirey PD and GA Lamberti, 'Assisted colonization under the U.S. Endangered Species Act' (2010) 3(1) *Conservation Letters* 45.

in part as a result of a conservation paradigm that prioritises preservation over adaptation.[34] This 'stationarity' paradigm, which presumes 'that natural systems fluctuate within an unchanging envelope of variability',[35] is apparent in international conventions and reinforced in the goals and legal mechanisms of domestic conservation laws, with significant implications for climate adaptation strategies such as conservation introductions.[36]

8.3.1 Conservation introductions in international law

The Convention on Biological Diversity ('CBD')[37] is the primary international instrument for species and habitat conservation. Article 8 establishes obligations for *in situ* conservation, defined as '[t]he conservation of ecosystems and *natural* habitats and the maintenance and recovery of viable populations of species in their *natural surroundings*'.[38] Article 9 establishes separate requirements for *ex situ* conservation, which is '[t]he conservation of components of biological diversity outside their natural habitats', emphasising that *ex situ* conservation should be 'predominantly for the purpose of complementing in-situ measures'. It should be undertaken 'preferably in the country of origin' of the biodiversity sought to be conserved,[39] and should be 'for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions'.[40]

While not decisive in the interpretation or application of domestic law, the IUCN has developed guidelines to support state parties to the CBD to develop rigorous, justifiable,

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[34] Craig, Robin K, '"Stationarity is dead" - long live transformation: five principles for climate change adaptation law' (2010) 34(1) *Harvard Environmental Law Review* 9, 31-2.
[35] Ibid; Milly PCD et al, 'Stationarity is dead: whither water management?' (2008) 319(5863) *Science* 573, 573.
[36] The potential barriers created by this paradigm are increasingly recognised in legal scholarship, eg Trouwborst, A, 'International nature conservation law and the adaptation of biodiversity to climate change: a mismatch?' (2009) 21(3) *Journal of Environmental Law* 419; Camacho, above n 33.
[37] Convention on Biological Diversity, opened for signature 5 June 1992, 1760 UNTS 79 (entered into force 29 December 1993).
[38] Emphasis added.
[39] CBD Art 9 *Preamble* and 9(a).
[40] CBD Art 9(c); in regional law, the EU's Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora [1992] OJ L206/7 ('EU Habitats Directive') prioritises maintenance and restoration of natural habitats and species at favourable conservation status, within each territory or member state, that is, *in situ*, Arts 1-2.

successful and principled conservation translocation law and policy.[41] The IUCN Guidelines explicitly acknowledge the unprecedented threat that climate change poses to biodiversity, recognising that climate change 'is the main force behind the proposition to move organisms deliberately outside their indigenous ranges…'.[42]

Some international legal instruments may be interpreted in a way that supports conservation introductions for adaptation, at least in some instances. For example, because the Convention on Wetlands of International Importance Especially as Waterfowl Habitat ('Ramsar Convention') directs conservation to the 'ecological character' of wetlands,[43] non-native vegetation may be able to be introduced to a Ramsar site as an ecological replacement, if doing so would help to maintain the wetland's function or avoid its transition to a new, less desirable ecological state.[44] In contrast, the Convention Concerning the Protection of the World Cultural and Natural Heritage ('World Heritage Convention')[45] obliges state parties to 'identify, protect, conserve, present, transmit to future generations and, if appropriate, rehabilitate' the cultural and natural heritage of outstanding universal value within their borders.[46] World heritage areas must be protected for their current ecological and cultural form or characteristics, rather than for their ecological function or adaptive capacity.[47]

A conservation introduction is, therefore, unlikely to be supported if it would affect the values for which a world heritage property was listed. Many locations recognised as representing the world's most valuable places, including world heritage areas, are some of the least likely to allow the introduction of non-native species. However, as climate change interacts with existing threats such as fire regimes and invasive species, those protected values may be changed or lost *unless* ecological replacements are introduced or critical

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[41] IUCN Guidelines 2013, above n 15, 1.
[42] Ibid.
[43] *Convention on Wetlands of International Importance especially as Waterfowl Habitat*, opened for signature 2 February 1971, 996 UNTS 246 (entered into force 21 December 1975) Preamble.
[44] Rogers, K, N Saintilan and C Copeland, 'Managed retreat of saline coastal wetlands: challenges and opportunities identified from the Hunter River Estuary, Australia' (2014) 37(1) *Estuaries and Coasts* 67, 75-6.
[45] *Convention concerning the Protection of the World Cultural and Natural Heritage*, opened for signature 16 November 1972, 1037 UNTS 151 (entered into force 17 December 1975).
[46] Ibid Arts 2, 4.
[47] See also 'Australian World Heritage Management Principles', Environment Protection and Biodiversity Conservation Regulations 2000 (Cth) Sch 5.

species are relocated from within those areas and introduced for their conservation elsewhere.

The way in which each instrument is implemented in domestic law will influence its role in facilitating strategies for biodiversity adaptation, as demonstrated in the following sections on Australia's national and sub-national law and policy frameworks for conservation introductions.

8.3.2 National law and policy for conservation introductions

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) ('EPBC Act') implements Australia's international conservation obligations, including under the CBD, and emphasises the protection of native species and ecological communities from extinction and the recovery of threatened species within their historical distribution.[48] Under the EPBC Act, the federal Environment Minister would be responsible for assessing and, if appropriate, permitting a conservation introduction in any of the following circumstances:

- the *target organism* is a matter of national significance, such as a nationally listed threatened species, or a listed migratory species;[49]
- the *location*, of either the origin or receiving environment, is a matter of national significance, for example, where an organism is introduced from or into a world heritage area or Ramsar wetland, or if the introduction is likely to result in a significant impact on such a place, including because it occurs nearby;[50] or
- the conservation introduction is likely to have a 'significant impact' on the environment generally (when the project proponent is a federal agency).[51]

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[48] EPBC Act s 3(2)(e)(i).
[49] Causing harm to a nationally listed threatened species may result in civil or criminal liability, EPBC Act ss 18, 18A.
[50] Causing harm to a world heritage property or Ramsar wetland may incur civil or criminal liability, EPBC Act ss 12, 15A ('world heritage'), ss 16, 17B ('Ramsar wetlands').
[51] EPBC Act s 28(1).

In each case, the proposed conservation introduction may also be subject to assessment and approval processes by the relevant state government if the receiving location, or the environment from which target species are removed, is located on state land.

In practice, managed relocation projects may be triggered by the terms of a threatened species recovery plan.[52] Recovery plans are statutory instruments prepared by the federal government for nationally listed threatened species.[53] Recovery plans can be used to prioritise conservation management actions, and are required to detail:

> the research and management actions necessary to stop the decline of, and support the recovery of, the listed threatened species… so that its chances of long-term survival in nature are maximised.[54]

A party proposing to conduct a managed relocation for a listed threatened species must typically prepare what is known as a 'translocation proposal'. The activities outlined in this proposal must comply with any pre-existing recovery plans, relevant legislation, and any other translocation policies and procedures for the listed threatened species.[55] However, recovery planning processes at both federal and state levels would currently only permit a conservation introduction that targets an ecological function – that is, an ecological replacement – if it was also associated with a species-specific conservation goal. This is because recovery plans are linked to statutory listing and recovery of threatened species and communities rather than ecosystem or landscape-scale conservation.

The federal government has published a policy statement that applies to proposed translocations of listed threatened species, including managed relocation and ecological replacements.[56] However, it does not consider the potential need for, and specific risks of, conservation introductions as distinct from other, less controversial forms of translocation such as reintroductions. The Federal Policy Statement requires that translocation proposals

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[52] Short, above n 25, 21.
[53] The Minister has a discretion to make a recovery plan for a listed species or ecological community, EPBC Act s 269AA; if a recovery plan exists, it must be implemented (at least on federal government land) s 269, and not contravened, s 268.
[54] EPBC Act ss 270(1), 270(2).
[55] Translocation proposals are procedural documents identifying all relevant information to the proposal including risk assessment details and scientific research.
[56] Australian Department of the Environment and Energy, *Translocation of listed threatened species - assessment under Chapter 4 of the EPBC Act* (2013) ('Federal Policy Statement').

demonstrate the impacts of the translocation are acceptable, by balancing the potential impacts of the introduction on the target plant or animal, the ecosystem from which it has been taken, and the receiving location.[57] Significantly, the likelihood of a target species becoming extinct if no action is taken—the key trigger for managed relocation—is not identified by the Federal Policy Statement as a relevant issue. Further, any potential benefits for the receiving location—the key purpose of ecological replacements—are expressly excluded when assessing whether an application falls within the jurisdiction of federal government review.[58]

There is no legal or policy guidance at the federal level in Australia for international conservation introductions. There is also no federal guidance for introductions across sub-national borders. These are significant governance gaps, and they will likely become more so as the climate changes and introductions across jurisdictional boundaries become more common.[59] In these circumstances, a federal policy for translocations, including conservation introductions, is needed.

8.3.3 State and territory law and policy for conservation introductions

As noted above, state law may apply in addition to Australian federal law for conservation introductions, or on its own *in situ*ations where there is no federal legislative trigger. Relevant state laws include wildlife management legislation imposing licensing or permit requirements for 'taking', 'harming', or 'releasing' native species and prohibiting the release of non-native species.[60] State translocation policies and procedural guidelines have also been developed under state-based conservation legislation.[61] Table 8.1 compares the

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[57] Ibid 3.
[58] Ibid 2; this demonstrates a lower priority in practice for ecosystem conservation over threatened species, though evidence of potential benefits to the receiving location would, presumably, be relevant to the ultimate question of whether the action should be permitted.
[59] Burbidge et al, above n 24, 264.
[60] Eg *Wildlife Act 1975* (Vic) s 28A authorises collecting, keeping and taking native wildlife; animal cruelty or ethics committee permits may also be required.
[61] New South Wales National Parks and Wildlife Service, *Policy and procedure statement no. 9: policy for the translocation of threatened fauna in NSW* (2001) ('NSW Policy'); Western Australian Department of Conservation and Land Management, *Policy statement no. 29:translocation of threatened flora and fauna* (1995) ('WA Policy'); Victorian Department of Environment and Primary Industries, *Procedure statement for translocation of threatened native vertebrate fauna in Victoria* (2013) ('Victorian Policy'); South Australian Government, *Draft translocations of native fauna policy 2006 (SA)*, and *Draft translocations of native fauna procedure 2006 (SA)* (neither publicly available); Northern Territory Government, *Translocating threatened animals policy, revised draft* (2009) (not publicly available); Queensland

key components of existing state policies for enhancing the adaptiveness of conservation introductions under climate change. State laws that govern the use of land, including protected area laws and land use planning may also play an important role in governing and constraining the use of conservation introductions for adaptation.[62]

State-based conservation translocation policies are developed under threatened species legislation or general conservation legislation and are generally triggered by the terms of recovery plans for threatened native species.[63] Common themes in these policies include licensing and permit requirements, which may involve multiple government agencies; emphasis on the extraordinary nature of translocations as a conservation strategy; and requirements for detailed risk analyses. These are valuable considerations that will continue to be important in adaptation-oriented conservation introduction law and policy.

Existing policies date from the 1990s and generally fail to acknowledge the novel challenges that climate change will create for conservation practice. Recognising climate change as a trigger for conservation introductions will be essential if these strategies are to be used for climate adaptation. Only Australia's most southern state, Tasmania, has a policy that acknowledges climate change as a potential trigger.[64] Released in 2011, Tasmania's policy is comparatively new, and includes the following features:

- an explicit recognition of the impact of climate change on native species, including acknowledging climate change as a potential trigger for translocation in some cases;
- a requirement that regional benefits for biodiversity arising as a result of a translocation be identified, including 'non-target positive spin-offs',[65]

Environment Protection Agency, 'Policy 5: requirements for the translocation, relocation and release of koalas' in *Nature conservation (koala) conservation plan 2006 and management program 2006-16* (2005) ('Queensland Policy'); Tasmanian Department of Primary Industries, Parks, Water and the Environment ('DPIPWE'), *Policy and procedures for translocations* (2011) ('Tasmanian Policy'), see comparison of the publicly available policies in Table 8.1, at the end of this chapter.

[62] The implications of different land tenures in Australian for supporting or hindering future conservation introductions has been analysed by Harris et al, above n 21.

[63] Eg Tasmanian Policy, above n 61, 4.

[64] Ibid 5.

[65] Ibid 13.

demonstrating an awareness of the potential broader implications of managed relocation outside of the immediate receiving location;

- a requirement for broad consultation, and recognition that some human communities may oppose the introduction of new species. The policy thus calls for explicit identification of communication strategies, and any '[p]ublic relations issues for uncharismatic or [seemingly] unwelcome species';[66] and

- a requirement that those attempting to implement conservation introductions in Tasmania demonstrate their long-term commitment to the translocation. This should include committing adequate: staff, budget, contracts, agency support, monitoring, and knowledge management (such as training and documentation).[67]

The Tasmanian Policy does not expressly acknowledge ecological replacement as a purpose for introductions.[68] Addressing policy silence or implicit acceptance of managed relocation and/or ecological replacement could have significant benefits for the transparency of agency decision making. In particular, explicit policy can clarify the scope of conservation agencies' mandate to investigate and, if appropriate, undertake such projects. It could also support agencies in rejecting inappropriate proposals, particularly those that demonstrate an unacceptably high level of risk or uncertainty in light of climate change projections and ongoing environmental change. Explicit acknowledgement of conservation introductions in policy could also support the development of more effective administrative arrangements to guide introduction assessment and approval decisions.

State policies generally prioritise reintroducing species within their historical distributions. They are typically silent on climate-specific challenges such as the complexity of identifying suitable future habitats as the climate changes. The policies also tend to neglect balancing the likelihood of endangered species extinction against the health, adaptive

[66] Ibid 15; a similar issue and requirement is addressed in the Victorian Policy, above n 61, 15.
[67] Tasmanian Policy, above n 61, 15.
[68] Ibid 4; the NSW Policy defines 'introductions' broadly to include situations in which 'the translocated species is to fill a niche role where such a role is crucial to the proper functioning or sustainability of the host environment', NSW Policy, above n 61, 6; Table 8.1, at the end of this chapter.

capacity and climate resilience of ecosystems in potential receiving locations.[69] This gap persists despite evidence that species are already independently shifting their distributions in response to climate change,[70] and evidence that long-term persistence of many species *in situ* is increasingly unlikely.[71] For example, the Western Australian Policy explicitly states that '[a]s a general principle, introductions will not be approved if opportunities for re-introductions exist'.[72] Opportunities for reintroduction may continue to exist even as climate projections demonstrate that habitat within a species' historical distribution will not be conducive to its survival in the medium-to-long term.

Existing policies focus primarily or exclusively on listed threatened species, and sometimes only on native vertebrates, fauna or one specific species, as detailed in Table 8.1. A broader perspective will certainly be necessary as climate-related threats cause sudden or unexpected declines across ecosystems.[73] The legislative process for listing species as threatened and developing resource-intensive recovery plans will increasingly be too slow to establish the traditional trigger for conservation introductions.[74] Conservation introductions may also need to target organisms that are less-frequently acknowledged, but critical to essential ecosystem functions, such as invertebrates or soil microbes.[75] Existing conservation laws are ill-equipped both to recognise these organisms as threatened and to support their *ex situ* conservation. Further, most state policies make no reference to the concept of ecological replacement as a strategy, let alone provide guidance for its effective, appropriate and adaptive use. Where keystone species – listed as threatened or not – become locally or globally extinct, ecological replacements may be essential, including for stabilising soil, preventing erosion or maintaining predation of a species that will otherwise become invasive.

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[69] Harris et al, above n 21, 107; McDonald-Madden E et al, 'Optimal timing for managed relocation of species faced with climate change' (2011) 1 *Nature Climate Change* 261.
[70] Eg Pecl et al, above n 8.
[71] Thomas et al, above n 8.
[72] WA Policy, above n 61, 4.
[73] Woinarski, John CZ et al, 'The contribution of policy, law, management, research, and advocacy failings to the recent extinctions of 3 Australian vertebrate species' (2016) 31(1) *Conservation Biology* 13.
[74] McDonald JA et al, 'Improving policy efficiency and effectiveness to save more species: a case study of the megadiverse country Australia' (2015) 182 *Biological Conservation* 102.
[75] Eg Classen, AT et al, 'Direct and indirect effects of climate change on soil microbial and soil microbial-plant interactions: what lies ahead?' (2015) 6(8) *Ecosphere* 130.

Translocation policies developed under state legislation currently only apply within that state. Species and ecological communities will not be constrained by political boundaries as they seek to adapt to changing climates. Conservation strategies that seek to promote adaptation will also, increasingly, need to involve collaboration across political borders.[76] No Australian state policy currently anticipates conservation introductions from outside Australia. Only policies in New South Wales and Victoria anticipate collaboration with other states to undertake translocations into *and* out of the state, see Table 8.1. The New South Wales Policy, for example, 'applies to all translocations of threatened fauna within, into or from NSW'.[77] The Western Australia Policy applies to 'translocations of threatened taxa undertaken by any person anywhere in Western Australia and to translocations of threatened Western Australian flora and fauna to places *outside* the State', but not to introductions into the state from elsewhere.[78] Other policies either do not acknowledge, or implicitly exclude, collaboration for interstate introductions.

The Tasmanian Policy only applies to the translocation of *Tasmanian* native plants and animals, *in* Tasmania.[79] The Tasmanian Policy's silence on whether and how introductions from outside Tasmania will be considered, provides no guidance at all on what is likely to become an exceptional climate adaptation challenge for Australia's southern-most state. Tasmania is an island state and climate projections indicate that the surrounding ocean will help to moderate some of the effects of climate change over coming decades.[80] As a result, the state has been identified as a critical climate refuge for many Australian species, that is, a place to which species may retreat and survive as the climate changes.[81] The absence of a clear, well-informed and strategic Tasmanian policy position on interstate conservation introductions therefore represents a significant policy gap. In particular, failing to

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[76] Burbidge et al, above n 24, 264-5.
[77] NSW Policy, above n 61, 3; although it appears that interstate species can only be introduced to NSW under this policy if they are listed as threatened under the NSW legislation; it remains to be seen whether the NSW government's enactment in late 2016 of the new *Biodiversity Conservation Act 2016* (NSW) will trigger a review of this translocation policy.
[78] See WA Policy, above n 61, 1, emphasis added.
[79] Tasmanian Policy, above n 61, 4; Queensland Policy, above n 61, 4 is directed only to 'conserving koalas in the wild in Queensland'.
[80] Eg DPIPWE, Tasmanian Government, *Vulnerability of Tasmania's natural environment to climate change: an overview* (Unpublished report, 2010) 6.
[81] Reside AE et al, *Climate change refugia for terrestrial biodiversity: defining areas that promote species persistence and ecosystem resilience in the face of global climate change* (National Climate Change Adaptation Research Facility, 2013) 49.

proactively engage with human communities about climate-related conservation introductions may restrict the availability of these strategies when they are most needed.

This analysis demonstrates a failure of existing law and policy governing conservation introductions to acknowledge the implications of climate change and, in particular, the growing need for regulatory guidance for conservation introductions as an adaptation strategy. Changes to species distributions, and ecosystem structures and functions, challenge presumptions in conservation laws about ecological equilibrium and ‘naturalness’, and cannot be ignored. Whether conservation introductions become a key adaptation strategy for biodiversity, or remain a strategy of last resort, existing legal and policy frameworks do not provide sufficient clarity to define their appropriate use, or adequately constrain inappropriate use, in a rapidly changing global climate.

8.4 Recommendations: new approaches and mechanisms for adaptation-oriented conservation introductions

Reform proposals for environmental law generally – to improve the capacity of laws to adapt to rapid global changes – will also enhance the capacity of conservation laws to help species and ecosystems adapt as the climate changes.[82] However, specific reforms will also be necessary to enable conservation introductions to be used for biodiversity adaptation. New legal mechanisms will be needed to effectively assess risk and support proactive adaptation-oriented conservation introductions. These mechanisms must be underpinned by broader legal purposes with the capacity to embrace conservation of traditional, emerging and novel combinations of biodiversity, both *in situ* and *ex situ*, in the context of ongoing ecological change. This section argues that reforms must not dilute accountability for difficult conservation decision making, and must prioritise adaptive management both within individual projects and for evolving conservation introduction practice.

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[82] Eg Arnold CA and LH Gunderson, ‘Adaptive law and resilience’ (2013) 43 *Environmental Law Reporter* 10426; Arnold CA and LH Gunderson, ‘Adaptive laws’ in Garmestani AS and CR Allen (eds) *Social-ecological resilience and law* (Columbia University Press, 2014) 243.

8.4.1 Broaden conservation purposes in law and policy

A fundamental pre-condition for achieving the reforms described below is to broaden the purposes that underpin conservation laws and policies.[83] Rapid climate change will reduce the success of traditional conservation law purposes that seek to restore environments to historical states, or render them unworkable. At the same time, the need for ‘high-intervention’ and transformative management strategies such as conservation introductions, will grow.[84] To be able to facilitate biodiversity adaptation effectively, such strategies must be supported by legal goals and objects clauses that anticipate significant climate-driven ecological change.[85]

For example, legal and policy definitions of ‘native’ biodiversity must be reformed to acknowledge that ‘naturalness’ is subject to ongoing change.[86] At present, ‘native’ biodiversity is typically defined by reference to historical species assemblages and political borders, rather than by reference to future suitable climates, or threats to ecosystem functions.[87] Defining a species as native based on historical records, and restricting its range to an environment that is no longer conducive to its survival, could operate as a barrier to actions that facilitate *independent* adaptation, let alone human-mediated conservation introductions.[88] Historical benchmarking also creates a conflict between conservation goals for protecting native species *in situ*, with that of preventing the

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[83] Chapter 4.

[84] Heller NE and RJ Hobbs, ‘development of a natural practice to adapt conservation goals to global change’ (2014) 28(3) *Conservation Biology* 696; Pritchard DJ and SR Harrop, ‘A re-evaluation of the role of ex situ conservation in the face of climate change’ (2010) 7(1) *BGJournal* 1, 2-3.

[85] For a synthesis of recommendations for reforming legal purposes, including overarching goals and specific objects clauses, Chapter 4, Section 4.2.2.

[86] Eg by recognising crucial ecosystem roles being played by ‘neo-native’ species, McCormack, Phillipa and Jan McDonald, ‘Adaptation strategies for biodiversity conservation: has Australian law got what it takes?’ (2014) 31 *Environmental and Planning Law Journal* 114, 129.

[87] Eg Mach KJ, S Planton and C von Stechow (eds), ‘Annex II: Glossary’ in IPCC, *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the IPCC* (Cambridge University Press, 2014); EPBC Act s 528; Rees, PA, ‘Is there a legal obligation to reintroduce animal species into their former habitats?’ (2001) 35(3) *Oryx* 216, 218; EU Habitats Directive, above n 40; Cliquet A et al, ‘Adaptation to climate change – legal challenges for protected areas’ (2009) 5(1) *Utrecht Law Review* 158, 172-4.

[88] Webber BI and JK Scott, ‘Rapid global change: implications for defining natives and aliens’ (2012) 21(3) *Global Ecology and Biogeography* 305, 308-9; Seddon, above n 19, 800.

extinction of species, or the loss of habitats and ecological communities, regardless of their geographical location.[89]

Ex situ interventions generally, and conservation introductions in particular, present a clear example of the challenge of facilitating adaptation using ‘stationary’ laws and policies. Shifting conservation law from a ‘stationarity’ paradigm to an adaptation-oriented paradigm is an ongoing process.[90] However, the reforms proposed below represent a starting point, and a chance to engage explicitly and proactively with the risks and opportunities of conservation introductions for conserving biodiversity as the climate changes.

8.4.2 National guidance for conservation introductions

As the climate changes, conservation introductions will sometimes involve multiple state or national jurisdictions. Cross-border collaboration will be necessary, for example, for species or ecosystems that cross political borders; and is more likely to be required when the rate of climate-induced redistribution is particularly rapid or if physical barriers impede independent migration, such as mountain ranges, cities or seas.[91] However, there is no guidance in Australia at the federal level for interstate or international conservation introductions. Only the policies of three Australian states explicitly contemplate some level of cooperation with other states, as demonstrated in Table 8.1.[92] A national policy, or at least nationally-consistent policies developed in collaboration between the federal, state and territory governments, will become increasingly important.[93] Similarly, multilateral conservation agreements for transnational conservation introductions would also be useful

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[89] Already the subject of judicial consideration in Finland where managed relocation of a population of threatened Barnacle Goose (*Branta leucopsis*) to a receiving location further north in the country was prohibited because it was not native to the proposed new habitat; Turun HAO [Finnish Supreme Administrative Court], 2247, 29 August 2012 <http://www.finlex.fi/fi/oikeus/hao/2011/turun_hao20110001>; discussed in Borgström, S, ‘Helping biodiversity adapt to climate change – implications for nature conservation law in Finland’ (2012) 1 *Nordic Environmental Law Journal* 31.
[90] Craig, above n 34.
[91] Ruhl JB, ‘Climate change adaptation and the structural transformation of environmental law’ (2010) 40 *Environmental Law* 363, 364.
[92] NSW Policy, above n 61, 3; WA Policy, above n 61, 4.2; Victorian Policy, above n 61, 1.
[93] A challenge that has recently been recognised, with initial steps towards such an outcome, at least for some forms of translocation, National Environmental Science Programme, ‘Threatened Species Recovery Hub’ <http://www.nespthreatenedspecies.edu.au/research/theme/theme-04-reintroductions-and-refugia>.

to overcome gaps in adaptation management for cross-border species[94] and where independent migration is not an option.[95]

There are four benefits to having national guidance on conservation introductions. First, a national policy could mitigate the complexity of planning and implementing conservation introductions in Australia, where environmental law is heavily fragmented across national, state, regional and local governance scales.[96] Second, a new policy framework could achieve greater consistency in decision making between state jurisdictions. For example, it could support the development of more consistent, rigorous standards for acceptable levels of risk for conservation introductions under a changing climate, or a transparent process for guiding state agencies that must make such decisions.

The third benefit of national guidance could be to facilitate collaborative and landscape-scale approaches to complex cross-border issues. For example, it may provide guidance on competing state interests and gaps in the legal conservation status of target species and assemblages between the Commonwealth, states and territory lists;[97] and a framework for interstate cooperation for identifying receiving habitat and introducing target organisms. Fourth, a national policy framework could provide ecologically and socially sound balancing processes to guide inevitable trade-offs between jurisdictions that are losing and/or gaining species. National policy could also support the involvement of multiple stakeholders, across tenures and state and territory borders, in undertaking both managed relocations and ecological replacements.

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[94] Eg Olive A, 'The road to recovery: comparing Canada and US recovery strategies for shared endangered species' (2014) 58(3) *The Canadian Geographer / Le Géographe Canadien* 263.
[95] Eg between Pacific Island nations, Kesler DC, 'Translocation as a conservation tool for restoring insular avifauna: Pacific Island restoration challenges' (Technical paper presented at the *Partners in Environmental Technology Technical Symposium and Workshop*, 29 November - 1 December 2011, Washington D.C.); and between Australia and its island neighbours such as Papua New Guinea and Indonesia.
[96] Eg Clement S, SA Moore and M Lockwood, 'Authority, responsibility and process in Australian biodiversity policy' (2015) 32 *Environment and Planning Law Journal* 93; but see Ruhl JB, 'General design principles for resilience and adaptive capacity in legal systems - with applications to climate change adaptation' (2011) 89 *North Carolina Law Review* 1373, 1396-7.
[97] While acknowledging that efforts to create a nationally consistent listing process for threatened species is already underway in Australia, this process is likely to take some time.

Any national policy framework would need to be developed collaboratively between national, state and local governments and other stakeholders.[98] In the Australian context, where a large number of successful re-introduction and managed relocation projects have been coordinated by large, environmental non-government organisations (ENGOs), ENGO stakeholders, conservation volunteers, Indigenous representatives and broader communities should also be involved.[99]

8.4.3 Integrate law and policy for conservation introductions and landscape-scale connectivity

In the absence of overarching national guidance, existing examples of integrated and cooperative cross-border governance arrangements could provide a framework for assessing, conducting and monitoring conservation introductions across the Australian continent. These include governance arrangements for transboundary and continental-scale corridors,[100] which are already considered to be important enabling tools for landscape-level conservation and climate adaptation.[101]

There is some overlap in considerations for implementing connectivity and conservation introduction strategies for adaptation, although connectivity initiatives are typically less controversial and are more widespread in practice.[102] Large-scale, transboundary, corridor restoration projects are underway in many parts of the world,[103] including across the Australian continent.[104] These projects seek to enhance landscape connectivity by restoring

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[98] Stein BA et al, 'Preparing for and managing change: climate adaptation for biodiversity and ecosystems' (2013) 11(9) *Frontiers in Ecology and the Environment* 502, 506.
[99] See, eg Australian Wildlife Conservancy, 'Wildlife translocations' <http://www.australianwildlife.org/field-programs/wildlife-translocations.aspx>; The Nature Conservancy, 'Rock-wallaby rescue', <http://www.natureaustralia.org.au/our-work/lands/rock-wallaby/>; lessons from engaging non-government groups and local communities in translocation planning under New Zealand's *Translocation guide for community groups* may also be instructive for developing multi-stakeholder translocation policy in Australia, New Zealand Department of Conservation, *Translocation guide for community groups: the translocation process – from the idea to reporting* (2011).
[100] Lausche B et al, *The legal aspects of connectivity conservation: a concept paper* (IUCN, 2013).
[101] Worboys GL, WL Francis and M Lockwood (eds), *Connectivity conservation management: a global guide* (Earthscan, 2010); McCormack and McDonald, above n 86, 124.
[102] Lawler, Joshua J and Julian D Olden, 'Reframing the debate over assisted colonization' (2011) 9(10) *Frontiers in Ecology and the Environment* 569, 572-3.
[103] Eg 'Yellowstone to Yukon Initiative' <https://y2y.net/>; and 'Algonquin to Adirondacks Collaborative' <www.a2acollaborative.org/>.
[104] Eg Worboys GL et al, 'The Australian Alps to Atherton (A2A) connectivity conservation area: a national response to climate change' (*Paper prepared for the Australian Protected Area Congress 2008*, 24 to 28

vegetation along important biodiversity corridors. Connectivity shares with conservation introductions a fundamental goal of removing barriers to climate-driven species redistribution, at landscape and continental scales.[105] Continental connectivity can also help to maintain or restore the integrity of natural ecological processes and overcome the ecological impacts of historical fragmentation; purposes to which ecological replacement is also intended to contribute.[106] Connectivity initiatives and conservation introductions also share common disadvantages, including increasing the risk of invasive species, disease and pathogen movement across landscapes.[107]

Connectivity initiatives engage a range of conservation laws and policy purposes, from site-specific restoration and habitat conservation obligations through to landscape connections between protected area networks. Governance frameworks for connectivity could integrate ecological replacements as a mechanism for facilitating ecosystem restoration and enhancing the resilience and adaptive capacity of emerging corridors as the climate changes. Corridor initiatives also operate within land use planning processes, foster intergovernmental engagement, and embody cross-tenure and community participation governance models.[108] As a result, connectivity initiatives may be able to support strategic planning for conservation introductions, at least in some cases, and provide pre-existing landscape-scale community engagement and conservation partnerships.[109]

Integrating corridor planning and conservation introduction planning could also allow agencies and environmental NGOs to identify suitable migration corridors for 'stepping stone' introduction sites. Stepping stone sites may be necessary when an introduction is conducted in multiple stages, for example, because habitat is not yet available in a location

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November 2008, Sunshine Coast); Lausche et al, above n 100, 3; Bennet A, *Linkages in the landscape: the role of corridors and connectivity in wildlife conservation* (IUCN Forest Conservation Programme, 2003) [1998].

[105] Lawler and Olden, above n 102, 572-3.

[106] Worboys, Francis and Lockwood, above n 101, 5-6.

[107] Invasive Species Council, 'Corridor risk assessment needed: a submission about the draft national wildlife corridors plan', submission to the National Wildlife Corridors Plan Advisory Group (April 2012) 7, suggesting that 'corridors should exclude areas where important conservation values depend on isolation from threats'.

[108] Eg Worboys et al, above n 104; Wyborn, Carina, 'Cross-scale linkages in connectivity conservation: adaptive governance challenges in spatially distributed networks' (2015) 25(1) *Environmental Policy and Governance* 1.

[109] Whitten, S et al, *A compendium of existing and planned Australian wildlife corridor projects and initiatives, and case study analysis of operational experience* (CSIRO Ecosystem Sciences, 2011) 43.

that will be climatically suitable in the long term.[110] Integrated governance mechanisms could also facilitate streamlined, climate-ready risk assessments and adaptive habitat restoration and design, improving practice and accountability for both connectivity and conservation introductions.

8.4.4 Adopt more proactive approaches to conservation introductions

Implementing adaptation-oriented conservation introductions will require new substantive and procedural legal tools. These tools should be developed in anticipation of a growing need for introductions, and should focus on both mitigating extinction through managed relocation *and* restoring or supplementing ecological function using ecological replacements.[111] Proactive legal frameworks for conservation introductions should explicitly anticipate a role for ecological replacements, to ensure that the strategy generates environmental gains and does not simply seek to avoid further environmental harm.[112] A proactive approach could be taken at three different stages. First, legal provisions that create absolute barriers to conservation introductions should be reviewed, and removed where appropriate, to ensure that the strategy can be used when needed. Second, proactive mechanisms should be developed to identify potential target species assemblages and ecosystems for introductions. Third, appropriate conflict management mechanisms should be in place well in advance of any conflict actually arising from the use of these strategies.

Legal and policy provisions that exclude conservation introductions *per se* should be reviewed to determine whether they are appropriate under climate change. Some statutory protected area management plans in Australia expressly exclude conservation introductions, such as:

> [The] introduction of fauna or fish (including Tasmanian fauna or fish) not historically indigenous *within the boundaries of the Park or Reserve* will not be allowed…[113]

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[110] Harris et al, above n 21, 108.
[111] First limb of the proactivity design principle, supporting proactive interventions, 'especially for endemic biodiversity at the limits of its climatic tolerance…', Chapter 4, Principle 1.
[112] Ibid, Principle 1, second limb of the proactivity design principle, generating environmental gains.
[113] Tasmanian Parks and Wildlife Branch, *Freycinet National Park and Wye River State Reserve Management Plan 2000* (2000) 39, emphasis added.

Absolute barriers to introductions, such as this one, may reduce opportunities for conserving species or ecological communities *ex situ*, to avoid extinctions and loss. However, broad barriers to introductions may also have negative implications for the conservation of ecosystems and ecological functions, *in situ*. For example, shifting climatic zones may trigger a need to introduce warm-adapted seedlings into protected areas from warmer or drier areas to enhance adaptive capacity. This will become particularly important as conditions change for native seed germination, a key biological process for replacing and sustaining existing plant populations. If these areas are not supplemented with new, young plants, some vegetation communities, or the broader ecosystems of which they are a part, may be lost.[114]

Proactive legal and policy approaches to conservation introductions may include a legislative duty to identify potential targets in anticipation of future introductions. Legislation or policy may focus such a duty on identifying species or communities with low adaptive capacity or proximity to barriers for independent migration, such as rivers, cities or mountain ranges. This duty could be modelled on an existing requirement in the WA Policy, that the state agency proactively identify sites at which 'vertebrate fauna [will be reconstructed] as far as is possible through predator control, habitat management and translocations'.[115] A climate adaptation-oriented version of this mechanism could integrate 'ecological restoration',[116] identifying sites where ecological functions, rather than specific species assemblages, could be restored through invasive species management and introducing ecological replacements.[117] This mechanism could also be used to trigger land use planning obligations, including to avoid, mitigate or offset harm to listed sites.

While maladaptive barriers should be removed, there may be a role for high conservation value, intact and ecologically resilient areas being pre-emptively declared 'no-go zones'

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[114] Eg Weeks, AR et al, 'Assessing the benefits and risks of translocations in changing environments: a genetic perspective' (2011) 4(6) *Evolutionary Applications* 709, 709-10; Hughes L, 'Can Australian biodiversity adapt to climate change?' in D Lunney and P Hutchings (eds), *Wildlife and climate change: towards robust conservation strategies for Australian fauna* (Royal Zoological Society of NSW, 2012) 8.
[115] WA Policy, above n 61, 4.1.
[116] Target 15 of the 'Aichi Biodiversity Targets', adopted by the Conference of the Parties ('COP') to the CBD, *Decision of the COP in its Tenth Meeting, Held in Nagoya from 18-29 October 2010 – Agenda item 4.4*, UN Doc UNEP/CBD/COP/DEC/X/2 (29 October 2010).
[117] Seddon, Philip J et al, 'Reversing defaunation: restoring species in a changing world' (2014) 345(6195) *Science* 406, 410.

for conservation introductions, particularly in the short term.[118] Similarly, ecosystems proactively identified as potential targets or receiving locations could benefit from streamlined assessment and permitting processes. Both of these outcomes could be supported by a bioregional planning approach[119] identifying particular tenures or ecosystems as ‘red’, ‘green’ or ‘amber’ zones for conservation introductions.[120]

In taking a proactive, bioregional approach to target receiving locations, red, no-go zones could be applied to prohibit or severely restrict conservation introductions, for example, at significant Indigenous sites or in remote and ecologically-resilient protected areas that are currently well-placed to adapt independently as the climate changes.[121] Green, experimentation zones could be applied to highly disturbed areas such as rehabilitated mine sites or marginal or abandoned agricultural areas, pre-emptively permitting conservation introductions subject to compliance with risk assessment and ethics obligations.[122] Amber, conditional zones could be applied to large-scale private conservation reserves or restored land within designated conservation corridors. Amber zones could identify areas where conservation introductions may sometimes be permitted, subject to additional assessment obligations.

Proactive approaches to this strategy must include anticipating the potential need for conflict management mechanisms.[123] Detailed ‘exit strategies’ in case of project failure, communication channels for dealing with community concerns, and explicit conflict resolution procedures will be required.[124] Conservation introductions under climate change will exacerbate the complexity of environmental law decision making, requiring trade-offs between multiple competing values and greater attention to the interplay between societal

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[118] Harris et al, above n 21, 107; Camacho, above n 33, 236.
[119] EPBC Act s 176.
[120] Pope, Jenny and Susan A Moore, *Planning and assessment for biodiversity conservation at a landscape-scale: an evaluation of current approaches and opportunities in Australia* (A report for the National Environmental Research Program, 2013).
[121] Facilitating independent adaptation wherever possible and conserving existing adaptive capacity will be fundamental for ensuring that conservation funds are allocated most efficiently as the climate changes.
[122] The concept of green zones may also be particularly valuable for adaptation-oriented ecological restoration and, potentially, the use of conservation introductions for rewilding, eg Seddon et al, above n 117, 410-1.
[123] Eg Schwartz and Martin, above n 29, 22, 24; IUCN Guidelines 2013, above n 15, cl 5.2; Camacho, above n 33.
[124] Eg Shirey and Lamberti, above n 33, 47-9.

values, project success or failure.[125] Existing Australian conservation laws and translocation policies lack guidance for managing these trade-offs and any resulting conflict between stakeholders, including across state borders or between state and federal governments. Further, no Australian policy establishes a proactive 'problem-solving mechanism' to anticipate and resolve potential community conflict, for example, in resisting a 'new' species being introduced to an area.[126]

8.4.5 Promote accountable flexibility

Conservation law and policy must become more flexible to support *ex situ* conservation strategies, allowing species and assemblages to be introduced to locations outside their historical distribution, for ecosystem – as well as species-specific – conservation purposes, and potentially in novel combinations. However, such a significant shift from traditional legal purposes must be accompanied by new accountability mechanisms, including rigorous risk assessments and enforceable decision-making standards, to ensure that climate adaptation is not used as a justification for 'giving up' on complex and expensive conservation tasks that could, for example, prevent biodiversity losses, *in situ*.[127]

Existing risk assessments, which are a procedural obligation in translocation proposal processes, are not well suited to the complexity of adaptation-oriented conservation introductions.[128] While environmental law often seeks certainty in regulating risk, climate change will create 'irreducible uncertainties' that will need to be appropriately identified and managed, without reducing the flexibility of this strategy to the extent that it is unusable.[129] Novel challenges that are typically not addressed in Australian risk assessment obligations for conservation introductions include accounting for the effects of future, rapid climate change on a target species or assemblage, and on the resilience of ecosystems in potential receiving locations.[130] Existing processes also fail to address how ecological,

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[125] Sandler, above n 27; Olson, ER et al, 'Pendulum swings in wolf management led to conflict, illegal kills, and a legislated wolf hunt' (2014) 8(5) *Conservation Letters* 351.
[126] IUCN Guidelines 2013, above n 15, cl 5.2; though both the Tasmanian Policy, above n 61, 15 and Victorian Policy, above n 61, 15 require that translocation proposals consider the potential for community resistance.
[127] Chapter 4, Principle 2.
[128] Burbidge et al, above n 24, 261; Weeks et al, above n 114, 718-9.
[129] Steffen et al, above n 23, 185; Schwartz et al, above n 16, 735.
[130] With the exception of Tasmania, see Table 8.1 at the end of this chapter.

social, political and economic risks should be identified and managed in cross-jurisdiction introductions.[131] Harmonised or standardised risk assessment requirements across federal and all state governments in Australia could provide important clarity about managing new climate-related risks and competing values across governance scales and state borders, as well as reducing duplication in assessment processes.

Current legal frameworks also emphasise case-by-case risk assessment for translocating individual species populations. This is at least partly because at present translocations are often triggered by threatened species recovery planning processes.[132] However, single-species introductions are only likely to be viable in the long term for 'generalist' species that are able to survive in a wide range of environments and do not have, for example, a specialist diet or restrictive habitat requirements.[133] As the climate changes, risk assessment tools will need to accommodate strategic assessments for multiple species, ecological communities, or entire habitats or ecosystems.[134] Ecosystem and habitat translocation projects are already taking place in the context of biodiversity offsetting projects for land use development and in mine site rehabilitation,[135] but may be regulated by different agencies to conservation introductions, and for legislative goals that may conflict with conservation outcomes.[136] Introducing multiple species and interacting ecological components will require a strong emphasis on transparency and accountability in risk assessment procedures, including through enhanced peer review and public reporting. This emphasis could help to promote legitimacy, and ensure that proposals

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[131] Camacho, above n 33, 254; the principle against transboundary harm may apply internationally, but domestically, recourse may need to be had to common law actions such as nuisance or tort.
[132] Section 8.3, above.
[133] Webber BL, JK Scott and RK Didham, 'Translocation or bust! A new acclimatization agenda for the 21st Century?' (2011) 26(10) *Trends in Ecology & Evolution* 495, 495.
[134] Lunt, Ian et al, 'Using assisted colonisation to conserve biodiversity and restore ecosystem function under climate change' (2013) 157 *Biological Conservation* 172; although such assessments do already take place in a land use and development context, Joint Nature Conservation Committee ('JNCC'), 'A habitats translocation policy for Britain' (JNCC, 2003); Box J, 'Habitat translocation, rebuilding diversity and no net loss of biodiversity' (2014) 28 *Water and Environment Journal* 540-6.
[135] Box J, 'Critical factors and evaluation criteria for habitat translocation' (2003) 46 *Journal of Environmental Planning and Management* 839-56.
[136] Eg Schwartz et al, above n 16, 737; McDonald J, PC McCormack and A Foerster, 'Promoting resilience to climate change in Australian conservation law: the case of biodiversity offsets' (2016) 39(4) *UNSW Law Journal* 1612, 1626-9.

deemed inappropriate can be prevented, while approved projects are closely monitored against new, climate-ready success criteria.[137]

Enforceable decision-making standards are a key mechanism for improving accountability, while allowing discretion and flexibility in the specific outcomes sought from any particular decision.[138] Standards and criteria should apply at two separate stages of decision making for conservation introductions. First, overarching triage or prioritisation decisions, including about which species, ecological communities and/or ecosystems are targeted for *ex situ* intervention such as conservation introductions, should be able to be measured against decision-making criteria. Ideally, triage criteria should be defined in legislation so that they form a clear, consistent and enforceable accountability mechanism.

The second stage at which standards can be applied, is during decision making for each individual conservation introduction project. This second stage includes decisions about where, how and when a particular introduction will take place; what biodiversity will be targeted; who will coordinate and participate in the project; and with what level of community engagement, government and non-government resourcing and monitoring and reporting obligations. Decision making standards should include those set out in Chapter 4, including an obligation to take into account: social and ecological implications over the short, medium and long term; cumulative ecological impacts; adaptive capacity of target species or ecosystems and receiving locations; and the best available information, including about climate impacts on biodiversity that will be affected by the proposed introduction.[139]

8.4.6 Prioritise adaptive management approaches

Limitations in existing law and policy for conservation introductions may result in introductions being attempted without legal oversight and without associated accountability, transparency, community consultation and risk assessment processes. However, existing limitations in legal frameworks and ‘far-from-perfect predictive

[137] Burbidge et al, above n 24, 261-3.
[138] Chapter 4, Section 4.3.
[139] Chapter 4, Principle 2.

capabilities',[140] mean that even sanctioned introductions risk significant ecological harm and lost opportunities for learning and adaptive management.[141] There are many, well-documented examples of unregulated introductions, including ongoing introductions by the 'Torreya Guardians' of an endangered US conifer north of its historical distribution;[142] and an 'unofficial' release of beavers in Scotland in a less-desirable receiving location than the site of a government reintroduction trial, taking place at the same time.[143] A large number of Australian mammals have also been introduced – unofficially, unregulated and unreported – to islands, including Western Grey Kangaroos and Tamar Wallabies in Western Australia.[144] As uncertainties associated with conservation introductions are exacerbated by independent, climate-driven redistribution of other species, including in receiving ecosystems, adaptive management must play a fundamental role in these strategies; supporting decision makers to both use *ex situ* conservation strategies effectively despite these uncertainties, and to reduce uncertainties over time.[145]

Adaptive management processes can be imposed at the scale of a particular project, decision or task,[146] such as statutory management planning for a specific protected area. Alternatively, adaptive management processes can be applied across a class of conservation decisions that, while individually large-scale and/or irreversible, are 'sufficiently similar that information gained from one can usefully inform another'.[147] Conservation introductions will often fall into the latter category.[148]

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[140] Settele et al, above n 9, 324.
[141] Fischer, J and DB Lindenmayer, 'An assessment of the published results of animal relocations' (2000) 96 *Biological Conservation* 1, 8-9.
[142] Torreya Guardians, above n 26; Shirey PD et al, 'Commercial trade of federally listed threatened and endangered plants in the United States' (2013) 6(5) *Conservation Letters* 300, 304.
[143] Initial plans to capture the 'feral' beaver population were abandoned in favour of monitoring and managing their impacts at the new site, Scottish Natural Heritage, 'Beavers' <http://www.snh.gov.uk/protecting-scotlands-nature/beavers/>.
[144] Eg WA policy, above n 61, 5; Short, above n 25.
[145] Rout, Tracy M et al, 'Optimal adaptive management for the translocation of a threatened species' (2009) 19(2) *Ecological Applications* 515; McDonald-Madden, E et al, 'Active adaptive conservation of threatened species in the face of uncertainty' (2010) 20(5) *Ecological Applications* 1476.
[146] Tomar, Sanjay and Darren Swanson, 'Formal policy review and continuous learning' in Darren Swanson and Suruchi Bhadwal (eds), *Creating adaptive policies: a guide for policy-making in an uncertain world* (Sage, 2009) 106, 113-4.
[147] Doremus, H, 'Precaution, science, and learning while doing in natural resource management' (2007) 82 *Washington Law Review* 547, 548-9, giving the example of 'salvage logging and wetlands filling'.
[148] Burbidge et al, above n 24; Fischer and Lindenmayer, above n 141.

No Australian legislation anticipates the use of conservation introductions as a conservation strategy, so there is no legislative provision or enforceable obligations to use adaptive management in this context. There is also no guidance for using adaptive management in *ex situ* conservation, at the national level. Existing state policies also fail to provide a comprehensive approach to adaptive management. Some state policy provisions do contribute to components of the adaptive management cycle, including through monitoring and reporting obligations,[149] but there is no indication of how an agency would require or enforce iterative decision making, for example, by requiring a project proponent to adjust a conservation introduction over time as a result of the outcomes of monitoring.

More effective adaptive management approaches must be developed and, as a key starting point, should include obligations for medium to long-term monitoring, in addition to short term obligations. Key characteristics for monitoring may include: actual or potential harm to populations, ecological interactions or ecosystem functions in the receiving environment; risk of extinction – immediately or in the foreseeable future – of the target for introduction; and the potential need to repeat the introduction in future, to a new location, to track fast-moving climatic conditions or escape rapid decline of habitat in the receiving environment. However, as noted in Chapter 4, monitoring is a necessary, but not sufficient, precondition for adaptive management. Proponents must also be required to change management approaches in response to monitoring outcomes. One tool for achieving this may be to identify at the outset of a project, management changes that will be ‘triggered’ by certain climatic or other environmental changes – speeding up the process of responding to those changes and ensuring that management is adapted over time.[150]

There will be some cases where adaptive management is not of value. For example, conservation introductions will sometimes require urgent, irreversible decisions – such as choosing not to intervene to prevent a species’ unexpected but imminent extinction – and there will not be enough time to rely on adaptive management to reduce critical

[149] Eg monitoring and ‘indicators of success’: Victorian Policy, above n 61, 4, 6; NSW Policy, above n 61, 18; WA Policy, above n 61, 13; reporting: only the Victorian Policy, above n 61, 14-5; research objective to contribute to learning: Victorian Policy, 9; NSW Policy, 18.
[150] Swanson, Darren et al, ‘Seven tools for creating adaptive policies’ (2010) 77(6) *Technological Forecasting and Social Change* 924; Bhadwal, Suruchi, Stephen Barg and Darren Swanson, ‘Automatic policy adjustment’ in Darren Swanson and Suruchi Bhadwal (eds), *Creating adaptive policies: a guide for policy-making in an uncertain world* (Sage, 2009) 56, 57-8.

uncertainties or improve information used to justify these decisions.[151] As noted in Chapter 4, 'problems of learning' will also arise in some cases, where climate change triggers changes that are so rapid, non-linear or substantial that adaptive management cannot be used to reduce the uncertainty of decision making, even if it is implemented perfectly.[152]

Prioritising adaptive management in legal and policy reform for conservation introductions could improve chances of success in individual introduction projects, particularly in cases where it will take many years for success or failure to become apparent. However, an adaptation-oriented law reform agenda must implement clear and enforceable adaptive management obligations to ensure improvements over time, both in the practice of conservation introductions and in legal and policy frameworks that govern the strategy.

8.5 Conclusion

Over time, human influences on the environment have become more pervasive, and adaptation strategies such as managed relocation and ecological replacements are expected to become more important for limiting extinctions and ecosystem decline. However, conservation legal frameworks are generally poorly prepared for the task of conserving species and ecosystems under rapid change, particularly where their future habitat is no longer located within their 'native' ecological range or legal jurisdiction.

Conservation introductions also clearly demonstrate the challenge of balancing competing conservation law purposes as the climate changes, such as avoiding species extinctions per se and conserving biodiversity *in situ*. These purposes cannot both be achieved if a species' niche environmental conditions shift as the climate changes.[153]

This analysis of Australian law and policy demonstrates key barriers to conservation introductions in current laws, including limited or no acknowledgement of climate change as a trigger for their use. Other observable barriers include a heavy reliance on recovery

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[151] Biber, Eric, 'Adaptive management and the future of environmental law' (2013) 46(4) *Akron Law Review* 933, 941-2; Woinarski et al, above n 73.
[152] Biber, above n 151, 943-4.
[153] McLachlan JS et al, 'A framework for debate of assisted migration in an era of climate change' (2007) 21(2) *Conservation Biology* 297, 297; Richardson DM et al, 'Multidimensional evaluation of managed relocation' (2009) 106(24) *Proceedings of the National Academy of Science USA* 9721, 9722-3.

planning under threatened species legislation to initiate conservation introductions, which has tended to limit the scope of the strategy to species-specific projects. Broader conservation goals are needed to facilitate adaptation-oriented conservation introductions, including by accommodating introductions that promote ecosystem function. Cooperation across governance scales is critical but will need to make inevitable trade-offs between competing conservation goals at each of those scales. Continental corridor initiatives are an existing mechanism that could support and inform the complex decision-making processes, and cross-border engagement, that will often be necessary for adaptation-oriented conservation introductions. However, new legal mechanisms will also be needed to guide complex decision making, and to conserve species and ecosystems, wherever they have the best chance of surviving.

State	Explicitly allows assisted colonization?	Mentions climate change?	Explicitly allows use of ecological replacements?	Cross-border collaboration anticipated?	Details
New South Wales	✓	✗	✓	✓	Applies to any fauna listed as threatened under the *Threatened Species Conservation Act 1995* (NSW) – that Act repealed by the *Biodiversity Conservation Act 2016* but without policy change as at Feb 2017. Not applicable to flora and explicitly excludes invertebrates. Translocation anticipated within NSW and both into and from NSW.
Queensland	✗	✗	✗	✗	Only applies to koalas (*Phascolarctos Cinereus*).
Tasmania	✓	✓	✗	✗	Applies to listed threatened flora & fauna native to Tasmania, generally limited to translocations required under a recovery plan or for a Wildlife Emergency Response (e.g. an oil spill). Explicitly excludes marine translocations, game releases, and horticultural plantings, among others.
Western Australia	✓	✗	✗	✓ (in part)	Applies to any flora and fauna listed as threatened under the *Wildlife Conservation Act 1950 (WA)* – that Act repealed by the *Biodiversity Conservation Act 2016 (WA)* without policy changes as at Feb 2017.
Victoria	✓	✗	✗	✓	Applies to native vertebrate fauna listed as threatened under the *Flora and Fauna Guarantee Act 1988* (Vic) or listed on the department's *Advisory List of Threatened Vertebrate Fauna in Victoria – 2013*. Explicitly excludes flora, fishes, fauna not native to Victoria, and native or exotic invertebrates, among others. Translocation anticipated within Victoria and both into and from Victoria.
NT, SA & ACT	No policy publically available for the **Northern Territory** (NT), **South Australia** (SA), and the **Australian Capital Territory** (ACT).				

Table 8-1 Features of Australian translocation policies relevant to climate adaptation

Chapter 9 Conclusion

As one of the most biodiverse countries on Earth, Australia has a lot to lose from climate-driven biodiversity loss. However, the challenges of arresting ongoing biodiversity loss and responding to climate change cannot be left to future generations of legislators, policy makers and decision makers: the climate is changing now. Climate change has already caused global extinctions, including of the Brambles Cay melomys, the small Australian mammal whose recent extinction was described in the opening paragraph of Chapter 1. Climate change has also triggered local extinctions,[1] and impacted every ecosystem on Earth, driving changes to *most* ecological processes such as species' distributions, interactions, genetics and seasonal behaviour.[2] These changes are all the result of a global average warming of less than 1 degree celcius.[3]

While protecting biodiversity *from* the effects of climate change will not be possible, conservation intervention may help many species, communities and systems to adapt, at least to some level of change. Despite the urgent need to implement crucial adaptation strategies for biodiversity, significant legal and policy hurdles remain. This research has taken a novel approach. Rather than analysing conservation laws and policies to assess their contribution to adaptation,[4] the research began with the most important adaptation strategies for biodiversity and used them to frame both the legal analysis and recommendations for reform. In this way, the research highlighted specific adaptation challenges and opportunities in Australian laws. It also offered targeted insights for legal reform to improve the implementation of these crucial adaptation strategies in future.

This concluding chapter summarises how the thesis answered the research questions posed in Chapter 1, linking the research questions to their specific answers and synthesising the

[1] Wiens, John J, 'Climate-related local extinctions are already widespread among plant and animal species' (2016) 14(12) *PLoS Biology* e2001104.
[2] Scheffers, Brett R et al, 'The broad footprint of climate change from genes to biomes to people' (2016) 354(6313) *Science* 719.
[3] Even the most optimistic climate projections now anticipate 2 degrees of warming or more, IPCC, 'Summary for policymakers' in CB Field et al (eds), *Climate Change 2014: Impacts, Adaptation and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the fifth assessment report of the IPCC* (Cambridge University Press, 2014).
[4] By analysing laws for protected areas, threatened species and communities, critical habitat and conservation-oriented threat abatement processes.

main findings. The research structure and methodology also supported broader research findings that cut across the adaptation strategies and substantive chapters. It then discusses the implications of the research and its contribution to the climate adaptation and biodiversity conservation legal scholarship of which it forms a part. It concludes by identifying the limitations or boundaries of the research, and highlighting opportunities for future research to improve the way that conservation laws facilitate biodiversity adaptation as the climate changes.

9.1 Research questions and answers

This research took a socio-legal approach, using a combination of doctrinal analysis of conservation law and policy; qualitative 'key informant' interviews; and thematic and content analyses. This approach supported the investigation of questions about 'what is in the law' as well as 'questions "about the law" as it operates in practice and for the purposes of reform'.[5] The primary research question asked: *How can Australia's legal frameworks for biodiversity conservation facilitate adaptation as the climate changes?* In answering this question, the thesis posed five subsidiary research questions (RQs):

I. What conservation strategies, discussed in the international biodiversity conservation literature, are considered the most important for an adaptation-oriented approach to biodiversity conservation?

II. What does the literature suggest are the key characteristics of these strategies for enhancing biodiversity adaptation outcomes?

III. To what extent are these strategies currently represented in Australia's legal frameworks for biodiversity conservation?

IV. To what extent do Australian legal frameworks for biodiversity conservation hinder or promote the effective implementation of these strategies?

V. How can Australian law be reformed to improve the representation and implementation of these strategies?

In answer to RQI, Chapter 2 set out the biodiversity adaptation strategies that are most commonly discussed in biodiversity conservation scholarship. These adaptation strategies

[5] Chapter 2, Section 2.2; McKerchar, Margaret, *Design and conduct of research in tax, law and accounting* (Thomson Reuters, 2010) 78.

are: (1) increasing and enhancing the protected area estate ('protected area strategy'); (2) improving landscape connectivity ('connectivity strategy'); (3) reducing non-climatic stressors ('non-climatic stressor strategy'); and (4) translocating organisms at risk of extinction and (5) engaging proactively with *ex situ* conservation (together, '*ex situ* strategy').[6]

To answer RQII, Chapter 3 identified the key characteristics of each of these adaptation strategies. In doing so, a series of overarching characteristics became apparent – which would apply to implementing any of the strategies. First, the starting point for effective implementation will always be to explicitly acknowledge – in legislation and/or statutory or policy instruments – the implications of climate change for the strategy's implementation. For example, to implement the protected area strategy for biodiversity adaptation, each new protected area must be located and designed with the recognition that climate change will affect biodiversity within and beyond the boundaries of that new protected area.

The second characteristic consistent across the strategies was that each must be implemented in a way that accommodates inevitable and ongoing environmental and climatic change. For example, efforts at restoring landscape-scale connectivity cannot be implemented in a way that presumes that vegetation communities will be unaffected by changing temperature, rainfall and bushfire conditions as the climate changes. Similarly, when planning adaptation-oriented conservation introductions, conservation managers must anticipate future environmental changes to the receiving location, to ensure that it will continue to support the introduced species or assemblage into the future.

The third consistent characteristic was that each of the adaptation strategies should be implemented in a way that conserves multiple scales of biodiversity. That is, a strategy such as managed relocation may be targeted at individual species populations but should also be designed and implemented in a way that accounts for broader ecological interactions, including ecosystem-wide benefits and the potential for 'cascading' or 'ripple'

[6] Chapter 1, Section 1.4; drawing on Mawdsley, JR, R O'Malley and DS Ojima, 'A review of climate-change adaptation strategies for wildlife management and biodiversity conservation' (2009) 23(5) *Conserv Biol* 1080 and Heller, Nicole E and Erika S Zavaleta, 'Biodiversity management in the face of climate change: a review of 22 years of recommendations' (2009) 142(1) *Biological Conservation* 14.

effects that affect whole ecosystems. As another example, when seeking to reduce the effect of invasive species as a non-climatic stressor for biodiversity, land managers should prioritise activities that reduce threats to broader ecological communities and whole ecosystems rather than an individual population of listed, threatened species.

RQIII was addressed in each of the chapters that focus on specific adaptation strategies. That is, Chapters 5 and 6 for the protected area and connectivity strategies, Chapter 7 for the non-climatic stressor and connectivity strategies, and Chapter 8 for the *ex situ* and connectivity strategies. Each of those chapters began with a doctrinal analysis of the existing legal framework, illustrating how each strategy is currently represented in Australian legal frameworks for conservation.[7] This analysis revealed that each of the strategies can be found – to varying extents – in existing legal frameworks. However, none of them is implemented explicitly as a response to climate change or to facilitate climate adaptation for biodiversity.

Chapter 7 demonstrated that the strategy of reducing non-climatic stressors is the best represented adaptation strategy, with clear obligations in national and state and territory laws to avoid and/or reduce the effects of threats to biodiversity, including land clearing and invasive species. Chapters 5 and 6 found that the protected area strategy – both for expanding and enhancing the protected area estate – is also being implemented through existing legal frameworks. There are legal and policy mechanisms that can be used to implement the connectivity strategy, but there is no explicit support for its implementation in national or state laws. Finally, Chapter 8 demonstrates that, of all of the adaptation strategies analysed in this thesis, the *ex situ* strategy's implementation is most limited in existing laws and policies with, for example, no explicit legal or policy support in most jurisdictions for the ecosystem-focused strategy of ecological replacements.

RQIV, which asked about limitations and opportunities in law for implementing the adaptation strategies, was answered in two parts. Chapter 4 provided the broad legal context, mapping existing statutory purposes[8] and underpinning conservation paradigms to identify general limitations and opportunities in Australian law for facilitating biodiversity

[7] A detailed analysis of how the connectivity strategy is represented in existing legal frameworks is provided in two parts, one in Chapter 5 and the other in Chapter 6, so Chapters 7 and 8 do not repeat that process.
[8] Including goals, objects clauses and objectives.

adaptation. Chapter 4 demonstrated that facilitating adaptation-oriented conservation is a particularly challenging task for laws that prioritise static conceptions of ‘wild’ nature, fragmented by legal definitions of ‘nativeness’ and endangerment.[9]

Chapters 5 to 8 provided the second part of the answer to RQIV, focusing on the legal framework to implement each specific adaptation strategy. Chapters 5 to 8 identified limitations that were consistent across the strategies, beginning with a lack of clarity about desirable conservation outcomes, particularly if preservation is no longer an appropriate or achievable goal.[10] Widespread failure to implement many existing laws and fund effective compliance undermine current conservation management and will be a challenge for all of the adaptation strategies.[11]

New conservation mechanisms are also emerging in Australia, such as biodiversity offsetting and Protected Area Downgrading, Downsizing and De-gazettement (‘PADDD’) processes.[12] These mechanisms may – from an optimistic perspective – offer new opportunities for adaptation-oriented conservation. However, without clear decision-making criteria and a commitment to enforcement, PADDD and offsetting are more likely to represent additional challenges for biodiversity adaptation efforts. Particular challenges include the risk of increasing current and future rates of habitat loss, affecting the availability of climate refugia, and reducing ecological resilience by removing ‘redundancy’ as a characteristic of ecosystems.[13] Chapters 5 to 8 also demonstrate repeated failures to adequately legislate, implement or achieve adaptive management processes and outcomes, a significant challenge for effectively facilitating adaptation for biodiversity.[14]

However, the news is not all bad. The integrated approach to analysing the connectivity strategy indicated that adaptation-oriented legal reform for each of the other strategies can

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[9] See Chapter 4.
[10] Eg Chapter 6, Section 6.4 (no clarity about the role of protected area management plans, including for adaptation).
[11] Eg Chapter 5, Sections 5.3.2, 5.3.3 (inadequate completion of the National Reserve System and limitations in its implementation); Chapter 6, Section 6.4 (failure to fund protected area management planning and many areas remain without compulsory plans); Chapter 7, Section 7.3.2 (demonstrable failure of native vegetation management regime).
[12] Eg Chapter 5, Section 5.3.4 (PADDD); Chapter 7, Section 7.3.4 (biodiversity offsetting); Section 7.3.2 (Regional Forest Agreements permitting clearing of endangered species’ habitat to benefit forestry industry).
[13] See generally, Chapters 5, 7.
[14] Especially Chapter 6, Section 6.4 (management effectiveness in protected area management planning).

also facilitate healthier, more connected and more permeable landscapes for biodiversity adaptation. For example, Chapter 6 recommended improving adaptation in protected area management by engaging in landscape-scale or bioregional planning for protected area management. That recommendation would improve the implementation of the connectivity strategy while also improving implementation of the legal design principles for the protected area strategy.[15] Similarly, integrating law and policy for conservation introductions and landscape scale connectivity was recommended as a way of improving efficiency, and effective risk assessment processes, for both strategies.[16]

This research also highlighted recent examples of conservation experimentation, increased flexibility and explicit efforts to support biodiversity adaptation as the climate changes. For example, despite overarching legislation having nothing to say about climate change in the National Reserve System, recent protected area plans are beginning to acknowledge climate implications and to take new and promising landscape approaches to statutory planning.[17] New market-based and seasonal conservation approaches are also being developed to conserve biodiversity outside of the formal, protected area estate, in ways that may be more conducive to dynamic conservation under rapid change. Government and non-government conservation projects are also beginning to embrace complex, high-cost interventions such as species reintroductions and engineered habitat solutions in a more proactive way.[18] These efforts will help to develop new expertise and provide practical examples of interventions that can be used in designing and reforming legal frameworks to improve adaptation-oriented conservation.

RQV sought recommendations for legal reform, to improve the representation and implementation of the strategies in Australia. Chapter 4 created a framework for answering this question by developing three new legal design principles: taking a proactive approach, improving ‘accountable flexibility’ and prioritising adaptive management. These principles

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[15] Chapter 6, Section 6.5.1.
[16] Chapter 8, Section 8.4.3.
[17] Chapter 6, Sections 6.3, 6.5.1.
[18] Eg NSW Office of Environment & Heritage, ‘Reintroducing locally extinct mammals’ (2017) <http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/saving-our-species-program/threatened-species-conservation>; Carlyon Peta, ‘Swift parrot ‘massacre’ warning as campaign raises funds for predator-proof nest boxes’ *ABC News* (online), 19 October 2017, <http://www.abc.net.au/news/2017-10-18/campaign-to-fund-deployment-of-swift-parrot-possum-keeper-outer/9062434>.

were used to make legal reform recommendations for implementing each of the adaptation strategies in Chapters 5 to 8. The principles are discussed in more detail in Section 9.2.

9.2 Broader findings and thesis implications

In addition to answering the specific research questions posed in Chapter 1, the thesis methodology and methods supported broader research findings that cut across the substantive chapters and adaptation strategies. These broader findings include insights into how each of the adaptation strategies are implemented, relative to each other; and the significance of interactions between implementing laws for each adaptation strategy and overarching legal ‘purposes’, including statutory objects clauses. This section demonstrates the way that these broader findings support the outcomes of research from other jurisdictions, but also highlight unique characteristics of the Australian legal context that require greater attention, in future.

Chapter 3 described the adaptation strategies as falling along a spectrum of ‘intensity’.[19] The strategies ranged from low-intensity interventions that are relatively low-risk and low-cost, such as increasing the number and diversity of protected areas, through to high-risk strategies with very specific information requirements and high levels of uncertainty, such as conservation introductions.[20] This research demonstrated that Australia’s legal frameworks are generally better prepared to facilitate biodiversity adaptation using ‘lower-intensity’ strategies such as protected areas. The highest intervention strategies described in this thesis – managed relocation and ecological replacement – will likely require significant legal reform to effectively facilitate climate adaptation.[21]

Legislative drafting practices were not a direct focus of this research, but the analysis in Chapter 4 revealed a need for greater clarity in drafting statutory goals and objects clauses for conservation law. Disciplined statutory drafting, guided by new drafting rules, could be a pre-condition to effective and comprehensive implementation of the adaptation strategies. Legal reform at that overarching scale, to clarify the ‘purpose’ of conservation laws, certainly has the potential to aid policy makers, decision makers and the judiciary in

[19] Chapter 3, Figure 3.2.
[20] Ibid.
[21] Chapter 8.

implementing and enforcing adaptation-oriented conservation management.[22] This research is the not the first to argue in favour of clearer expression in legal objects clauses, or for the value of articulating measurable objectives in statutory instruments. It does, however, provide a detailed and practical application of such recommendations to Australian conservation legislation.

During the course of this research, it also became clear that reforming legal objects clauses will be a far more complex task than it seemed at first. There is a host of controversies in scientific scholarship about what conservation management should be seeking to achieve. For example, should climate change trigger a shift in conservation priorities towards improving genetic diversity, independent adaptive capacity, ecological health and interactions, achieving 'zero extinction' or conserving geodiversity or 'nature's stage'?[23] These controversies suggest that the challenges are not only for legislative drafting practices. Rather, the question of 'what should conservation management be seeking to achieve?' appears to go to the heart of how humans value non-human nature,[24] and the challenge of balancing competing perspectives on the environment and biodiversity, intrinsic and utilitarian values, environmental ethics and philosophy, including about the role of human intervention in 'natural processes', and so on. This conversation is just beginning.[25] While there is still much work to be done, this research provides a legal perspective on the 'status quo' and a foundation for future reform proposals.

Research findings for each of the adaptation strategies in this research supported many of the conclusions from research taking place in other jurisdictions. For example, Fischman and colleagues identified shortcomings in protected area management planning in the US

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[22] Eg *MyEnvironment Inc v VicForests* (2013) 42 VR 456.
[23] Eg Somero, GN, 'The physiology of climate change: how potentials for acclimatization and genetic adaptation will determine 'winners' and 'losers'' (2010) 213(6) *The Journal of Experimental Biology* 912; Parr, MJ et al, 'Why we should aim for zero extinction' (2009) 24(4) *Trends Ecol Evol* 181; Lawler, Joshua J et al, 'The theory behind, and the challenges of, conserving nature's stage in a time of rapid change' (2015) 29(3) *Conservation Biology* 618; and strong objections to certain proposals or priorities, eg Vila, Montserrat and Philip E Hulme, 'Jurassic Park? No thanks' (2011) 26(10) *Trends in Ecology & Evolution* 496; Davidson, Ian et al, 'Letters… assisted colonization won't help rare species' (2008) 322 *Science* 1048.
[24] Including whether the distinction between humans and non-human nature is realistic, reasonable or helpful.
[25] Eg Camacho, Alejandro E et al, 'Reassessing conservation goals in a changing climate' (2010) 26(4) *Issues in Science and Technology* 21; Hagerman, Shannon M and Terre Satterfield, 'Agreed but not preferred: expert views on taboo options for biodiversity conservation, given climate change' (2014) 24(3) *Ecological Applications* 548; McDonald, Jan et al, 'Rethinking legal objectives for climate-adaptive conservation' (2016) 21(2) *Ecology and Society* 25.

National Wildlife Refuge System, particularly for implementing adaptive management.[26] This was also a central finding about Australian protected area management planning, in Chapter 6 of this research. Similarly, research by Joly and Fuller and, separately, Alejandro Camacho, found that US laws provided some mechanisms for implementing managed relocations but none specifically targeted at, or fully equipped to, respond to the challenges of climate change.[27] The findings in Chapter 8 of this research found similar challenges in Australian laws and policies for conservation introductions.

As noted above, this thesis also developed three new legal design principles to frame the analysis and recommendations for reform. The first design principle was to improve proactive approaches to biodiversity conservation to facilitate climate adaptation.[28] This principle was developed to capture the 'future-focussed' orientation of scientific adaptation literature, and has been expressed and applied in this research, for the first time. The proactivity principle supported recommendations for legal reform that counter-balance the inherently conservative orientation of existing laws. As a result, this principle may offer insights for future climate adaptation research and legal analysis, more generally.

The second principle, to improve 'accountable flexibility', adopted recommendations from scientific and legal adaptation literature to improve legal flexibility for conservation. Crucially, the principle balances greater flexibility against the fundamental importance of transparency and accountability in decision making, as the climate changes.[29] This principle draws on Robin Kundis Craig's concept of 'principled flexibility', which she first proposed in her seminal article for adaptation-oriented environmental law, 'long live stationarity'.[30] Prior to this research, the concept of principled flexibility had not been applied to an analysis of Australian law. Craig's concept was adapted in the accountable flexibility principle, and reframed as a *legal design* principle to clarify its practical

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[26] Fischman, Robert L et al, 'Planning for adaptation to climate change: lessons from the US National Wildlife Refuge System' (2014) 64(11) *BioScience* 993; Meretsky, VJ and R Fischman, 'Learning from conservation planning for the U.S. National Wildlife Refuges' (2014) 28(5) *Conservation Biology* 1415.
[27] Camacho, Alejandro E., 'Assisted migration: redefining nature and natural resource law under climate change' (2010) 27(2) *Yale Journal on Regulation* 171; Joly, Julie L. and Nell Fuller, 'Advising Noah: a legal analysis of assisted migration' (2009) 39(5) *Environmental Law Reporter* 10413.
[28] For specific 'proactivity' reform proposals, see Sections 5.4.1; 5.4.2; 6.5.2; 7.3.3; 7.4.3; 8.4.4.
[29] For recommendations to improve 'accountable flexibility', see Sections 5.4.1; 5.4.3; 6.5.3; 7.3.4; 7.4.4; 8.4.5.
[30] Craig, Robin K, '"Stationarity is dead" - long live transformation: five principles for climate change adaptation law' (2010) 34(1) *Harvard Environmental Law Review* 9.

application to future legal research and law reform in Australia. This thesis demonstrated the value of accountable flexibility for facilitating climate adaptation, as it accommodates greater flexibility in conservation management – including for new, controversial mechanisms such as PADDD and biodiversity offsetting – while continuing to require rigorous and transparent decision-making *processes* and accountability for achieving conservation outcomes.[31]

The third legal design principle was to prioritise adaptive management for conserving biodiversity as the climate changes.[32] This principle synthesised recommendations from the broad and rapidly growing adaptive management literature, making recommendations about what is widely regarded as a fundamental characteristic of adaptation-oriented conservation law and practice.

9.3 Research limitations and future research agenda

This project was ambitious in its scope – crossing multiple governance scales and multiple adaptation strategies – and generated a broad and substantial contribution to the adaptation-oriented conservation law literature. This section identifies limitations in the project's scope and highlights opportunities for future research to tackle these questions.

As is the case for all doctoral research projects, there were unanticipated and unavoidable challenges. For example, shortly after this project began, the New South Wales State Government announced a 'root and branch' review of its biodiversity conservation laws, which culminated in the release of an entirely new statute, the *Biodiversity Conservation Act 2016*, in late 2016. NSW was not one of the 'nested' jurisdictions selected as a focus in this research, but this review represented the most recent legislative effort to overcome the limitations of legal frameworks to facilitating adaptation. There was, unfortunately, no scope in this thesis to analyse in detail the progress, or otherwise, that the NSW statute represents for the research questions. However, this thesis presents a research frame, including the new, adaptation-oriented legal design principles, to support such an analysis in future.

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[31] Chapter 5, Section 5.4.3 (PADDD); Chapter 7, Section 7.3.4 (biodiversity offsetting).
[32] For specific adaptive management recommendations, see Sections 6.5.4; 7.3.5; 8.4.6.

A growing body of adaptation and conservation research, coming particularly out of the United States, focuses on institutional adaptive capacity and other institutional factors such as resistance to new approaches, fear of failure and agency fragmentation.[33] Institutional adaptive capacity is an issue that is very relevant to the legal analyses and findings in this research. For example, resistance to novel conservation approaches within government agencies has been identified as a challenge in Australia, including to conservation triage approaches, despite the clear efficiency imperatives.[34] While this issue was beyond the scope of this research, institutional analyses deserve greater attention in Australia, particularly given the distinctions in agency structure, culture and operation to those in the United States.

This thesis did not include a specific analysis of the adaptiveness of laws and policies for threatened species conservation. This decision, as explained in Chapter 2, was a result of the research focus on the adaptation strategies. Nevertheless, a central concern for any transition from a legal focus on threatened species to 'something broader', is (1) what, in particular, should the new focus be; and (2) how, specifically, should a transition to that new focus be achieved? One participant in this this research suggested that a starting point might be a shift from prioritising species recovery to prioritising threat abatement – a structural or risk-based approach to conservation priorities:

> So you might have 10 key threats that might affect 200 species in different ways so you look at which *threat* to manage to get the best bang for your dollar rather than which *species* to manage.[35]

Preliminary work is underway to define the parameters of such a reform agenda, but more work is needed.[36]

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[33] Eg Camacho, Alejandro E and Robert L Glicksman, 'Legal adaptive capacity: how program goals and processes shape federal land adaptation to climate change' (2016) 87(3) *Colorado Law Review* 711; Jantarasami, LC, JJ Lawler and CW Thomas, 'Institutional barriers to climate change adaptation in U.S. national parks and forests' (2010) 15(4) *Ecology and Society* 33; Steffen, W et al, *Australia's biodiversity and climate change: a strategic assessment of the vulnerability of Australia's biodiversity to climate change* (Biodiversity and Natural Resource Management Adaptation Team, Commonwealth Department of Climate Change, 2009) 171, 185.

[34] Kilham, E and S Reinecke, '"Biggest bang for your buck": Conservation triage and priority-setting for species management in Australia and New Zealand' (2015) *INVALUABLE Policy Brief 0115* 7-9.

[35] Interview #20 (advocate).

As noted in Chapter 1, this thesis focused exclusively on legal frameworks for terrestrial and freshwater biodiversity conservation. Biodiversity conservation in the marine sphere is governed by legal frameworks that 'raise discrete legal and ecological issues for climate adaptation'.[37] While a detailed and comparative analysis of marine conservation law and policy was beyond the scope of this thesis, a parallel project investigating whether marine law and policy facilitate or hinder climate adaptation for marine species and environments is important and desirable.

Chapter 8 found that existing laws and policies for implementing the *ex situ* strategy are insufficient to facilitate climate adaptation. That chapter did not undertake the task of designing a new, comprehensive legal and policy framework for implementing this strategy. Key considerations for future research on that issue include opportunities to learn from species translocations in both biodiversity offsetting and land use development contexts – where species assemblages and ecological communities have already been translocated to make way for new developments. Strategic risk assessments applied in some states through quarantine and biosecurity laws could also be investigated for their application to conservation introductions, including across state borders. New legal and policy approaches to conserving climate refugia and novel ecosystems should also be integrated with legal frameworks for conservation introductions, to support new forms of habitat and to accommodate rapidly shifting climatic niches for introduction targets.

Despite the research focus on conservation law, many interview participants insisted that the most significant challenge for implementing the adaptation strategies is a detachment or alienation of humans from natural environments and climate-driven change. For example, participants suggested that, 'the underlying issue is that people are not understanding what's going on';[38] 'and our biggest problem is that we exclude people from the landscape…';[39] and that, in a recent, government strategic planning exercise, 'the top

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[36] Chapter 4, Section 4.2.2(d); McDonald et al, above n 25, McDonald, Jan and Phillipa McCormack, 'Overcoming barriers to effective conservation under climate change' (Public forum and expert workshop, National Climate Change Adaptation Research Facility Ecosystems Network, 2016).
[37] Chapter 1, Section 1.1.
[38] Interview #12 (consultant).
[39] Interview #23 (consultant).

threat across all of the assets, was an unengaged [sic] and uninformed community'.[40] These results are supported in climate adaptation[41] and conservation literature,[42] but deserve greater research attention to ensure that legal reform to implement the adaptation strategies has sufficient community and political support.

Adaptation-oriented conservation laws will not provide a complete answer to the challenge of climate change for biodiversity. For some species and ecosystems, reforms to conservation law and full implementation of the adaptation strategies are already too late.[43] Nevertheless, legal frameworks have an important role to play in climate adaptation. Along with every other legal and governance response available, conservation laws must be designed to ensure that as much biodiversity as possible adapts and survives in this rapidly changing climate that humans have created.

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[40] Interview #26 (government); and 'if people aren't interested then I don't think you're really going to achieve anything', interview #8 (government).
[41] Adger N et al, 'Are there social limits to adaptation to climate change?' (2009) 93 *Climatic Change* 335, 337-8.
[42] Steffen et al, above n 33, 184; Cresswell ID and HT Murphy, *Australia State of the Environment 2016: Biodiversity* (Independent report to the Minister for the Environment and Energy, Commonwealth Government, 2017) <https://soe.environment.gov.au/theme/biodiversity> 11-13.
[43] Chapter 1, Section 1.2; United Nations Environment Progamme, *Frontiers 2016 report: emerging issues of environmental concern* (2016) 44.

Chapter 10 References

Each section is in alphabetical order.

A Articles/Books/Reports

Adams, V and K Moon, 'Security and equity of conservation covenants: contradictions of private protected area policies in Australia' (2013) 30 *Land Use and Policy* 114

Adams, Vanessa M et al, 'Planning across freshwater and terrestrial realms: co benefits and trade offs between conservation actions' (2014) 7(5) *Conservation Letters* 425

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Victorian Department of Environment, Land, Water and Planning, 'Domestic firewood collection on public land' (2015) <http://www.depi.vic.gov.au/?a=177495>

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World Wide Fund for Nature (‘WWF’), ‘PADDDtracker: Australian country profile’ (2017) <www.padddtracker.org/>

Appendices

Appendix 1: Project documents

(a) Invitation to participate in research
(b) Project information sheet
(c) Indicative interview schedule
(d) Ethics consent form

Appendix 2: Stakeholders invited to participate in research

(a) List of interview participants
(b) List of positions/departments that declined or were unable to participate

Appendix 3: Ethics approvals and reporting

(a) Project ethics approval
(b) Annual ethics report 2015
(c) Final ethics report 2016
(d) Email approving project ethics final report 2016

Appendix 4: Statutory protected area management plans

Details of the statutory protected area management plans reviewed for this research and discussed in Chapter 6

Appendix 5: Permission to use published material in this thesis

A.1(a): *Invitation to participate in research*

Dear [*participant*]

Request for interview: biodiversity and the law – promoting climate change adaptation through legal frameworks

I am a PhD candidate at the Faculty of Law, University of Tasmania. My research explores the efficacy of Australia's legal frameworks for biodiversity conservation under climate change. My research considers whether, and how, Australia's biodiversity conservation and natural resource management laws should be reformed and better implemented to facilitate biodiversity adaptation.

Interviews with government decision-makers and non-government land managers and advocates are a key component of the project, and will provide important context about the practical experience of applying biodiversity conservation law.

I **attach** an information sheet with further details about my research, and an invitation to participate in an interview. I hope that you will be able to help by participating in this research. If you have any questions please do not hesitate to contact me on the details provided, below.

I look forward to hearing from you.

Yours sincerely
Phillipa

Phillipa McCormack
BA/LLB (Hons), PhD candidate
Faculty of Law, University of Tasmania
m: 0419 360 244
e: phillipa.mccormack@utas.edu.au
skype: phillipa.mccormack

A.1(b): ***Project information sheet***

Private Bag 89 Hobart
Tasmania 7001 Australia
Phone (03) 6226 2065 Fax (03) 6226 7623

FACULTY OF LAW

UTAS

U N I V E R S I T Y O F T A S M A N I A

Information Sheet for Project Participants

Biodiversity and the law: promoting climate change adaptation through legal frameworks

You are invited to participate in a research project investigating how Australia's legal frameworks for biodiversity conservation and natural resource management (NRM) can better facilitate adaptation to climate change.

This study is being conducted in partial fulfilment of a PhD by Phillipa McCormack at the Faculty of Law, University of Tasmania, Hobart. The conduct of this research is subject to supervision by Professor Jan McDonald (Faculty of Law, University of Tasmania), Dr Michael Lockwood (School of Land and Food, University of Tasmania), and Ms Louise Gilfedder (Senior Conservation Scientist, Tasmanian Department of Primary Industries, Parks, Water and the Environment).

As part of this research, interviews are being conducted with decision-makers in government at the Commonwealth, state and local levels, and with regional NRM bodies, non-government organisations and technical experts. The interviews are a key component of the project and will provide important context to the research about the practical experience of applying biodiversity conservation law. The insights gained from the interviews will be used to better understand the gaps and barriers in the law for biodiversity adaptation, and to develop proposals for reform and better implementation of the law so that it can more readily facilitate conservation and adaptation under climate change.

Why have I been invited to participate and what will I be asked to do?

We are seeking the perspective of those most closely involved in implementing biodiversity and NRM laws, about the strengths and weaknesses of existing legal frameworks in the context of climate change.

Interviews will be conducted at a time and date that is mutually convenient and, if possible, at a location of your choice. Alternatively, if required, interviews may be conducted by Skype or telephone. Each interview should take no more than 45 minutes. Interviews will be audio recorded and transcribed, and the researcher will take notes.

Your involvement in this research is voluntary and, should you choose to participate, you can withdraw at any time without providing reasons. If you decide that you wish to withdraw after completing an interview, you can contact the researcher (details below) and amend or withdraw part, or all, of your transcribed responses from the research project, and/or request that your responses not be used in any research publication.

How will the information be used and what will happen to it when the study is over?

Information collected through interviews will be used as data to support the researcher's doctoral thesis, and may be used in presentations and publications of the research findings, including conference proceedings and peer-reviewed journals. Participants will be provided with an electronic copy of such publications.

Given that this research will not focus on personal experiences, but perspectives on how the law might be improved, we propose to identify interview data by reference to an interviewee's position only, not by name. This means that, in some cases, it may be possible to ascertain a participants' identity. Should you have any concerns about being quoted or identified by your position, you will have the option of requesting to be referred to anonymously only (this would include a reference to your status in a government or non-government role; and your jurisdiction: Commonwealth, state, regional or local). Participants are encouraged to avoid providing information that is confidential, defamatory or that could have a negative impact on them or the organisation by which they are employed.

For all purposes other than research publications, information provided to the researcher in the course of interviews will be treated as confidential and will be stored in a secure location at the Faculty of Law, University of Tasmania. None of the information will be released to third parties except in the form of research publications (as discussed above); with the consent of the interviewee; or as required by law. Information obtained through interviews will be kept for five years from the date of the final interview, after which it will be deleted or destroyed.

What if I have questions about this study?

If you have any questions about the project or wish to participate in an interview, please contact the researcher by telephone or email.

Phillipa McCormack
PhD candidate, Faculty of Law
University of Tasmania
Tel: 0419 360 244
Email: phillipa.mccormack@utas.edu.au

This study has been approved by the Tasmanian Social Sciences Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study, please contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. Please quote ethics reference number H0013848."

This information sheet is for you to keep as a reference document. If you agree to participate in an interview, we will send you a consent form to confirm further details of your participation.

A.1(c): *Indicative interview schedule*

This research investigates the extent to which Australian law implements key management strategies identified in the biodiversity literature as most important to promote adaption under climate change, and how the law and its implementation could be improved.

A. Conservation Objectives *Some suggest that Australia's current conservation objectives, including as they are represented in legal instruments,[1] are misdirected and perhaps unachievable under future climate change. They suggest that conservation objectives should be revised but there is limited discussion about how that might be achieved and the form that new objectives might take.*	
1.	Do you think that the objectives in conservation legislation in Victoria need to be revised in the context of climate change? ☐ **Yes** ☐ **No** *If yes*: how could conservation objectives in the law better promote adaptation as climate change progresses?
B. Selecting new protected areas *Increasing and enhancing Australia's protected area network has been identified as a fundamental strategy for biodiversity adaptation.[2] As climate change progresses, the legal framework for selecting and managing protected areas is likely to be placed under increasing pressure, and may need to be reformed to support adaptation.* *Part B is about the identification and selection of new protected areas in Australia, and how the state government's role in this process might change in future.*	
2.	*Commonwealth, state and territory, and local governments all play a role in expanding and managing Australia's protected area estate. Government roles range from providing leadership and information, through to funding and direct acquisition and management.* How do you think that the role of governments, in identifying and reserving new protected areas, may need to change in future, particularly in the context of climate change?

[1] Conservation objectives are the values prioritised in law, and the outcomes that legislation seeks to achieve. At the Commonwealth level, objectives include to "protect native species (and in particular prevent the extinction, and promote the recovery, of threatened species)…") in section 3(2)(e)(i) – something that will be increasingly difficult to achieve under climate change; legislative priorities for protected areas in Tasmania also include to 'protect' against change (i.e. Sch 1 of the *National Parks and Reserves Management Act 2002* objectives for protected areas include "(g) to protect the national park against, and rehabilitate the national park following, adverse impacts… [and] (j) to preserve the natural, primitive and remote character of wilderness areas"); and state-based legislation seeks to protect, for all time, threatened and endangered native species (*Nature Conservation Act 2002*).

[2] I.e. the *Australian Biodiversity Conservation Strategy 2010–2030* aims to increase the area of native habitat managed for conservation by 600 000 km^2 by 2015, at p 10.

3.	*The current legal framework establishes, at its core, the importance of a comprehensive, adequate, and representative system of reserves ('the CAR criteria'); and relies on IBRA data[3] and strategic conservation planning to inform new acquisitions.* How achievable do you think the CAR criteria are for protected area selection in the context of climate change? □ **Very achievable** □ **Achievable in part** □ **Not achievable** *If achievable in whole or in part*: how might these criteria be used in future in selecting new protected areas to emphasise climate adaptation for biodiversity? *If not achievable*: what do you think that new protected area acquisitions should be seeking to achieve?
4.	*Many threatened and endemic communities and ecosystems only exist on private land. However, as climate change progresses and trade-offs between biodiversity, industry and human adaptation needs increase, acquiring private land for conservation is likely to become more expensive.* What role do you see private land playing in conservation and natural resource management for biodiversity adaptation under climate change?
C. Managing protected areas *Part C is about whether and how you think the legal framework for managing protected areas should change in a future affected by climate change.* *The 'legal framework' here means the legal and policy requirements that direct biodiversity management in protected areas, including:* - *funding commitments tied to particular management outcomes;* - *the terms of formal management plans and conservation covenants; and* - *positive statutory obligations (i.e. to manage pest species).*	
5.	*Climate change is likely to lead to changes in species assemblages and ecosystem function, and in some cases to biodiversity loss, including within established protected areas.* (a) In that context, what do you think that protected area management law should be seeking to achieve? (b) Where change is inevitable, how can the legal requirements for protected area and land management be used to facilitate adaptation across landscapes and tenures?

[3] Interim Biogeographic Regionalisation for Australia, accessible at: www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra.

D. Non-climate threats to biodiversity *Part D is about threats to biodiversity other than climate change, particularly threats that undermine resilience and increase biodiversity's vulnerability to change and loss.*	
6.	*Australia is one of the most biodiverse countries on earth but also has one of the highest rates of biodiversity decline and extinction.* If there was one non-climate stressor for Australian biodiversity for which you could have full government and non-government support (including funding) at all levels to resolve: (a) What would it be? (b) What would you do to address that stressor?
E. General *Part E takes a broader perspective and asks generally about the strengths and weaknesses of Australia's legal framework for conservation under climate change.*	
7.	What do you think are the key strengths of Australia's existing legal regime for conserving biodiversity at the state government level in the face of climate change?
8.	What do you think are the key weaknesses of Australia's existing regime for biodiversity conservation at the state government level in the face of climate change?
F. Conclusion	
9.	Do you have any other comments about Australia's biodiversity conservation laws under climate change?

A.1(d): ***Participant consent form***

Private Bag 89 Hobart
Tasmania 7001 Australia
Phone (03) 6226 2065 Fax (03) 6226 7623

UTAS

UNIVERSITY OF TASMANIA

Consent Form for Project Participants

Biodiversity and the law: promoting climate change adaptation through legal frameworks

1. I agree to take part in the research study named above.
2. I have read and understood the Information Sheet for this study.
3. The nature and possible effects of the study have been explained to me.
4. I understand that the study involves an interview of approximately 45 minutes duration. I understand that the interview will be recorded in audio format, transcribed, and notes will be taken.
5. I understand that participation involves minimal risks which have been outlined in the Information Sheet. These risks will be managed by ensuring the confidentiality of participants and only using direct quotes and references in published materials with prior written consent (see 9 below).
6. I understand that all research data will be securely stored on the University of Tasmania's premises for five years from the completion of the final interview, and will then be destroyed.
7. Any questions that I have asked have been answered to my satisfaction.
8. I understand that the researcher will maintain confidentiality and that any information I supply to the researcher will be used only for the purposes of the research.
9. I understand that although information obtained during the interviews will form the basis for the researcher's doctoral thesis and may be published in academic reports, journals or books, my name and position title will not be used in relation to any of the information I have provided unless I explicitly consent in writing to be identified when quoted. I agree to be identified as a participant in the publication of the study results.

☐ By position [That is, by reference to government/non-government status and, where relevant, level of government: federal, state, regional or local]

☐ Anonymously

Page 1

10. I understand that my participation is voluntary and that I may withdraw at any time without any effect.

Participant's name: ____

Participant's signature: ____

Date: ______________________

Statement by Investigator

☐ I have explained the project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

If the Investigator has not had an opportunity to talk to participants prior to them participating, the following must be ticked.

☐ The participant has received the Information Sheet where my details have been provided so participants have had the opportunity to contact me prior to consenting to participate in this project.

Investigator's name: Phillipa McCormack

Investigator's signature: ____

Date: ______________________

A.2(a): *Research participants*

The positions listed here are the positions that the interview participants held at the time that they were interviewed.

Name	Position	Category
Prof Ted Lefroy	Professor and Director of the Centre for the Environment, University of Tasmania	Research
Assoc Prof Geoff Wescott	Associate Professor, Deakin University and Board member, Victorian Environmental Assessment Council (VEAC)	
Dr Rebecca Harris	Climate research fellow, Antarctic, Climate and Ecosystems Cooperative Research Centre (ACE CRC)	
Prof Lesley Hughes	Distinguished Professor, Climate Change Ecology Group, Macquarie University and Director of the Australian Climate Council	
Prof Jamie Kirkpatrick	Distinguished Professor, Geography and Conservation Ecology, University of Tasmania	
Dr Michael Dunlop	Integration scientist on climate adaptation, Land and Water Division, Commonwealth Scientific and Industrial Research Organisation (CSIRO)	
Dr Dermot Smyth	Principal consultant, Smyth & Bahrdt	Consultants
Amanda Cornwall	Director Amanda Cornwall consulting	
Doug Humann	Former CEO of Bush Heritage and Director of Doug Humann and Associates consultancy	
Dr Josie Kelman	Consultant, Enviro-Dynamics	
Dr Anita Wild	Ecological consultant and founder of Wild Ecology	
James Tregurtha	Assistant Secretary, Compliance and Assessment Division of the Commonwealth Department of the Environment	Commonwealth government
Katie Eberle	Assistant Secretary, Adaptation and International Climate Change Division of the Commonwealth Department of the Environment	

Name	**Position**	**Category**
Louise Mendel	Section Leader, Conservation Partnerships (private land conservation) and acting Section Leader, Threatened Species, Tasmanian Department of Primary Industries, Parks, Water and the Environment (DPIPWE)	State government
John Harkin	Section Leader, Conservation Assessment Section, Resource Management and Conservation Division, DPIPWE	
Peter Mooney	Director, Tasmanian Parks and Wildlife Service, DPIPWE	
Allison Wooley	Senior Policy Officer, DPIPWE, Project Manager, Biosecurity law and policy review project	
Brian Doolan	Director, Environmental and Visitor Planning Group, Parks Victoria	
Andrew Nixon	Manager, National Parks Program for the Australian Alps, Parks Victoria	
Marike van Nuyhuys	Native Vegetation Management Officer (North East Region), Victorian Department of Environment, Land, Water and Planning	
Victoria Marles	Chief Executive Officer, Trust for Nature	State government (statutory authority)
Dr Doug Robinson	Conservation Science Coordinator, Trust for Nature	
Don Thompson	Sustainable Agriculture Facilitator for Tasmania and Western Australia, Commonwealth Department of Agriculture	Regional government (Cth)
Luke Diddams	Natural Resource Management (NRM) planning and knowledge team leader, NRM South	Regional (statutory authority)
Greta Quinlivan	Project manager, ‘Exploring the Links Carbon and Biodiversity’ and ‘Woodland and Wetlands’ projects, North East Catchment Management Authority (NECMA)	
Matthew O’Connell	Coordinator of Regional Strategy, NECMA	
Nikki den Exter	Environmental planner, Kingborough City Council, Tasmania	Local government

Name	**Position**	**Category**
Liz Quin	NRM coordinator, Kingborough City Council, Tasmania	
Claire Coulson	Natural resources planner, City of Wodonga, Victoria	
Prue Day	Climate adaptation planning project officer, Indigo Shire Council, Towong Shire Council and City of Wodonga, Victoria	
Jane Hutchinson	Chief Executive Officer, Tasmanian Land Conservancy	Advocates/NGOs
Daniel Sprod	Conservation scientist, Tasmanian Land Conservancy	
Samantha Vines	Head of Conservation, Birdlife Australia	
Jeff Smith	Executive Director, NSW EDO	
Nick Sawyer	President, Tasmanian National Parks Association	
Vanessa Bleyer	President, Environment Tas (Peak body for environmental NGOs in Tasmania)	
Matt Ruchel	Director, Victorian National Parks Association	
Jess Feehley	Principal, EDO Tas	
Brendan Sydes	Principal, Environmental Justice Australia	
Vica Bayley	Tasmanian Campaign Manager, Wilderness Society	
Total government	*19*	
Total research	*6*	
Total advocacy/NGO	*10*	
Total consultant	*5*	
Total participants 40		

A.2(b): *Invited but did not participate*

The organisations and positions listed below were contacted for this research project but did not participate. This list is included for completeness. There were various reasons why those contacted did not participate. As discussed in Chapter 2, some did not respond, others were not available during the interview period, some did not consider themselves to have sufficient relevant expertise, or undertook to participate but were forced to withdraw prior to the interview, and some listed below redirected the candidate's query to another division or individual who ultimately participated in the research.

- Current and former directors and planners at Parks Australia, Commonwealth Government parks agency
- Various positions within Commonwealth Government including section managers for strategic policy, regulatory reform taskforce, science division, domestic adaptation and biodiversity conservation
- Commonwealth Department of Agriculture Sustainable Agriculture Facilitator and/or Natural Resources Management coordinator for Victoria
- Consultant, Midlandscapes conservation and ecological restoration project, Tasmania
- Greening Australia, CEO and restoration ecologist
- Independent climate adapation and planning consultant engaged by Kingborough City Council
- Environmental NGO with large private conservation estate across Australia
- Birdlife Australia threatened species committee
- Protected area management expert, associated with 'best practice' management planning for the Australian Great Barrier Reef Marine Park Authority

- Tasmanian Forest Practices Authority, biodiversity and policy division
- Hydro Tasmania, legal division
- Independent consultants associated with protected area management planning, NRM and climate adaptation associated with the Commonwealth National Environmental Research Programme, Landscapes and Policy Hub
- Consultant, BioLinks Victoria
- Environment Victoria, Peak body for environmental NGOs in Victoria
- Conservation/environment officers with North East Catchment Management Authority
- Department of Environment and Primary Industries, conservation section and legal and policy section
- University Professor specialising in private land conservation and law

A.3(a): *Project ethics approval*

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2763
Fax: (03) 6226 7148
Katherine.Shaw@utas.edu.au

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

UTAS

5 March 2014

Professor Jan McDonald
Faculty of Law
Private Bag 89

Student Researcher: Phillipa McCormack

Sent via email

Dear Professor McDonald

Re: MINIMAL RISK ETHICS APPLICATION APPROVAL
Ethics Ref: **H0013848 - How can Australia's legal frameworks for biodiversity conservation and natural resource management facilitate adaptation to climate change?**

We are pleased to advise that acting on a mandate from the Tasmania Social Sciences HREC, the Chair of the committee considered and approved the above project on 04 March 2014.

This approval constitutes ethical clearance by the Tasmania Social Sciences Human Research Ethics Committee. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approval of other bodies or authorities is required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics

Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.

2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.

3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.

5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**

6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely

Katherine Shaw
Executive Officer
Tasmania Social Sciences HREC

A.3(b): ***Annual ethics report 2015***

HUMAN RESEARCH ETHICS COMMITTEE
(TASMANIA) NETWORK

SOCIAL SCIENCE HREC
PROGRESS REPORT FORM

For the period of: 4 March 2014 – 23 January 2015.

Important: Please send an electronic version of this report as a Word document to katherine.shaw@utas.edu.au.
A signed copy of this form also needs to be forwarded electronically.

If you have any questions, please call: 6226 2763

1. Project Details	
Ethics Reference No.	H0013848
Project Title	How can Australia's legal frameworks for biodiversity conservation a[r] natural resource management facilitate adaptation to climate change?

2. Investigators	
A. Chief Investigator	
Name:	Professor Jan McDonald
Phone:	(03) 6226 2070
Email address:	jan.mcdonald@utas.edu.au
Contact address:	Faculty of Law, University of Tasmania Private Bag 89, Hobart TAS 7001
B. Other Investigators **(If a student, please indicate his / her student status (Honours, PhD etc))**	
Name:	Phillipa McCormack
Status:	PhD candidate

3. Status of Application		
Indicate which status applies to the project and include appropriate dates:		
In progress? ☒	Anticipated completion date: 24/12/2015	**Go to Section 4**
Not yet commenced? ☐	Anticipated start date:	**Go to Section 7**

4. Ethical Issues		
Please answer YES or NO to the following questions. If you answer YES to any question, give details below. Please attach a separate sheet if there is insufficient space.		
	Yes	No
Have any participants withdrawn from the project during this year? *If yes,* please provide details.	☐	☒
Did any ethical issues arise during the research? *If yes,* provide details, including whether or not they were foreseen, and how the were resolved.	☐	☒
Have there been any unexpected or adverse effects experienced by the subjects?	☐	☒
If yes, how many adverse events were experienced?_______________		
Have all unexpected or adverse events been reported to the committee?	☐	☐
If adverse events were not reported, please explain why and append the reports.		
Have there been any complaints received from subjects? *If yes,* please provide details of the complaint, and how it has been resolved.	☐	☒
Have you departed at all from the protocol that was approved? *If yes,* please provide details.	☐	☒

Has there been any breach of confidentiality of data, which includes identifying information? *If yes,* please provide details, including what was done to remedy the breach. …………………………………………………………………………………………	☐	☒

5. Progress Report
Please provide a brief report on the progress of the project and a description of any results that have been obtained: The student researcher, Phillipa McCormack, commenced interviewing participants in Tasmania in September 2014. Since then, she has interviewed 14 people in Tasmania, six people in Victoria, and eight people working at the Commonwealth level. There are still a number of interviews to be completed (up to 15) with some already arranged to take place in the next week. We anticipate that all interviews will be completed by 13 February 2015.
Please list any publications, conference papers, presentations, abstracts of theses etc. which have so far resulted from the study and attach copies to this report: **n/a**

6. Data Storage
Please state how and where your data is being stored, and for how long it will be retained. Address any issues of data security. *Please note: Data must be stored for at least five years beyond the date of publication and then destroyed. All data must eventually be destroyed, unless explicit consent is obtained from the participants to archive their data.* Handwritten interview notes and consent forms are stored in a locked filing cabinet at the Faculty of Law, University of Tasmania. Electronic copies of the audio files are currently stored on a university-issued laptop, and on an external hard drive kept in a secure cabinet offsite (student researcher's home address). Audio files, written transcripts and signed consent forms will be retained for five years from the date of publication of the student researcher's thesis. Handwritten notes from the interviews will be destroyed at the completion of the student researcher's PhD candidature.

7. Changes to Application	
Do you anticipate that you will be making any changes to the approved protocol?	Yes ☐ No ☒

If yes, please complete and submit an Amendment Form (available on our website at http://www.utas.edu.au/research/integrity-and-ethics/human-ethics/social-sciences-hrec/social-sciences-hrec-forms/). All study documentation that is affected by the proposed changes to the protocol must also be submitted. Please use Track Changes when altering study documentation. The Amendment Form and altered study documentation may be submitted electronically to Katherine.Shaw@utas.edu.au.

8. Statement by Chief Investigator
I accept that the information provided in this report is a true record of the research undertaken by myself, or the students under my supervision: **Chief Investigator name:** Professor Jan McDonald **Chief Investigator signature:** **Date:**

A.3(c): ***Final ethics report***

HUMAN RESEARCH ETHICS COMMITTEE
(TASMANIA) NETWORK

SOCIAL SCIENCE HREC
FINAL REPORT FORM

For the period of: 4 March 2014 – 21 January 2016.

Important: Please send an electronic version of this report as a Word document to katherine.shaw@utas.edu.au
A signed copy of this form also needs to be forwarded electronically.

If you have any questions, please call: 6226 2763

1. Project Details	
Ethics Reference No.	H0013848
Project Title	How can Australia's legal frameworks for biodiversity conservation ar natural resource management facilitate adaptation to climate change?

2. Investigators	
A. Chief Investigator	
Name:	Professor Jan McDonald
Phone:	(03) 6226 2070
Email address:	jan.mcdonald@utas.edu.au
Contact address:	Faculty of Law, University of Tasmania Private Bag 89, Hobart TAS 7001
B. Other Investigators **(If a student, please indicate his / her student status (Honours, PhD etc))**	
Name / status:	Phillipa McCormack
Name / status:	PhD candidate

3. Status of Application
Indicate which status applies to the project and include appropriate dates:

Completed? ☒	Completion date: 30 April 2015	**Go to Section 4**
Abandoned? ☐	Date project abandoned:	**Go to Section 5**

4. Completed Projects
Please list the aims of the project that was originally approved: **Extract of 'Aims' section of *Minimum Risk Application* 21/02/2014:** "This research draws upon conservation literature to identify key management strategies that will help Australian biodiversity to adapt under climate change. I propose to identify ways in which Australian law might be reformed and better implemented to incorporate those strategies and facilitate adaptation-focussed conservation practice".
Were these aims achieved? Yes ☒ No ☐ Please provide a brief explanation: The student researcher's thesis has not yet been finalised but data collection is complete. Preliminary analysis of the data indicates that it directly addresses the aims set out above.
Please list any publications, conference papers, presentations, abstracts of theses etc. which have resulted from the study and attach copies to this report: **Outputs currently being drafted, not published to date.** **Go to Section 6**

5. Abandoned Projects
Did the project commence? Yes ☐ No ☐
Why was the project abandoned? Please provide brief details, including whether the abandonment created any ethical issues. If so, how they were resolved. Describe any data that was collected and indicate how it has been stored and / or destroyed. If any publications have resulted from this project, please list any publications, conference papers presentations, abstracts of theses etc. and attach copies to this report: **Go to Section 6**

6. Data Storage
For completed and abandoned projects, if applicable, please state how and where your data is being stored, and for how long it will be retained. Address any issues of data security. *Please note: Data must be stored for at least five years beyond the date of publication and then destroyed. All data must eventually be destroyed unless explicit consent is obtained from the participants to archive their data.* Handwritten interview notes and consent forms are stored in a secure cabinet at the student research's home address. Electronic copies of the audio files are currently stored on a university-issued laptop, and on an external hard drive kept in a secure cabinet offsite (student researcher's home address). Audio files, written transcripts and signed consent forms will be retained for five years from the date of publication of the student researcher's thesis. Handwritten notes from the interviews will be destroyed at the completion of the student researcher's PhD candidature.

7. Ethical Issues		
Please answer YES or NO to the following questions. If you answer YES to any question, give details below. Please attach a separate sheet if there is insufficient space.		
	Yes	No
Did any participants withdraw from the project during this year? *If yes,* please provide details.	☐	☒
Did any ethical issues arise during the research? *If yes,* provide details, including whether or not they were foreseen, and how the were resolved. …………………………………………………………………………	☐	☒
Have any participants suffered harm or adverse effects? *If yes,* has this been reported to the committee? If not, please explain why and append the reports. …………………………………………………………………………	☐	☒
Have any complaints been received regarding the project? *If yes,* please provide details of the complaint, and how it has been resolved. …………………………………………………………………………	☐	☒
Have you departed at all from the approved protocol? *If yes,* please provide details.	☐	☒

…………………………………………………………………………………………..
Has there been any breach of confidentiality of data, which includes identifying information? ☐ ☒   *If yes,* please provide details, including what has been done to remedy the breacl   ………………………………………………………………………………………………

8. Statement by Chief Investigator
I accept that the information provided in this report is a true record of the research undertaken by myself, or the students under my supervision: **Chief Investigator name:**   **Chief Investigator signature:** **Date:**

A.3(d): ***Email approving final ethics report 2016***

From:	Katherine Shaw
To:	Jan McDonald
Cc:	Phillipa McCormack; Michael Lockwood; louise.gilfedder@dpipwe.tas.gov.au
Subject:	Ethics Final Report Approved: H0013848 How can Australia"s legal frameworks for biodiversity conservation and natural resource management facilitate adaptation to climate change?
Date:	Friday, 19 February 2016 4:01:44 PM
Attachments:	image001.png

Dear Professor McDonald

Ethics Ref No: H0013848
Project title: How can Australia's legal frameworks for biodiversity conservation and natural resource management facilitate adaptation to climate change?

This email is to confirm that your Ethics Final Report was approved by the Tasmania Social Sciences Human Research Ethics Committee on 15/2/2016.

Should you have any queries please do not hesitate to contact me.

Kind regards
Katherine

Katherine Shaw
Executive Officer, Social Sciences HREC
Office of Research Services | Research Division
University of Tasmania
Private Bag 1
Hobart TAS 7001
T +61 3 6226 2763
www.utas.edu.au/research

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A.4: *Statutory protected area management plans*

This table sets out all of the details of the statutory management plans reviewed for the analysis in Chapter 6.

KEY: Cth: Commonwealth PWS: Tasmanian Parks and Wildlife PV: Parks Victoria

Title of statutory management plan	**Date of plan**	**Period covered by the plan**	**Jurisdiction/Managers**	**No. of PAs covered**	**Plan status**
Australian National Botanic Gardens Management Plan 2012-2022	2012	2012-2022	Cth/Parks Australia	1	Current
Booderee National Park Draft Management Plan 2011-21	2011	2011-2021	Cth/Parks Australia/Wreck Bay Aboriginal Community Council	1	Draft
Booderee National Park Management Plan 2002-2009	2002	2002-2009	Cth/Parks Australia	1	Current
Christmas Island National Park Management Plan 2014-2024	2014	2014-2024	Cth/Parks Australia	1	Current
Kakadu National Park Management Plan 2016-2026	2016	2016-2026	Cth/Parks Australia/Kakadu National Park Board of Management	1	Current
Norfolk Island National Park and Norfolk Botanic Garden Management Plan 2008-2018	2008	2008-2018	Cth/Parks Australia	2	Current
Pulu Keeling National Park Management Plan Draft 2015-2025	2015	2015-2025	Cth/Parks Australia	1	Current
Uluṟu-Kata Tjuṯa National Park Management Plan 2010-2020	2010	2010-2020	Cth/Parks Australia	1	Current

Title of statutory management plan	Date of plan	Period covered by the plan	Jurisdiction/Managers	No. of PAs covered	Plan status
Arthur-Pieman Conservation Area Management Plan 2002	2002	Not specified	Tas/PWS	1	Current
Ben Lomond National Park Management Plan 1998	1998	2009-2019	Tas/PWS	1	Current
Coningham Nature Recreation Area Management Statement 2009	2009	2009-2019	Tas/PWS	1	Current
Douglas Apsley National Park Management Plan 1993	1993	Not specified	Tas/PWS	1	Current
Joint Management Plan for the Egg Islands Reserve and Egg Islands Conservation Area 2009	2009	2009-2019	Tas/PWS/Tasmanian Land Conservancy	2	Current
Freycinet National Park Management Plan 2004 (altering the Freycinet National Park, Wye River State Reserve Management Plan 2000)	2004	Not specified	Tas/PWS	1	Addendum
Freycinet National Park and Wye River State Reserve Management Plan 2000	2000	Not specified	Tas/PWS	2	Current
Kent Group Management Plan 2005	2005	2005-2015	Tas/PWS	1	Current
Lake Johnston Nature Reserve Management Plan 1999	1999	Not specified	Tas/PWS	1	Current
Logan Lagoon Ramsar Draft Management Plan 2000	2000	Not specified	Tas/PWS	1	Draft
Macquarie Island Nature Reserve and World Heritage Area Management Plan 2006	2006	Not specified	Tas/PWS/Cth government	2	Current
Maria Island National Park and Ile Des Phoques Nature Reserve Management Plan 1998	1998	Not specified	Tas/PWS	2	Current

Title of statutory management plan	Date of plan	Period covered by the plan	Jurisdiction/Managers	No. of PAs covered	Plan status
Melaleuca-Cox Bight Management Statement 2014	2014	2014-2024	Tas/PWS	1	Current
Mole Creek Karst National Park and Conservation Area Management Plan 2004	2004	Not specified	Tas/PWS	2	Current
Moulting Lagoon Game Reserve (Ramsar Site) Management Plan 2003	2003	Not specified	Tas/PWS	1	Current
Mt Field National Park, Marriotts Falls State Reserve & Junee Cave State Reserve Management Plan 2002	2002	Not specified	Tas/PWS	3	Current
Murphys Flat Conservation Area Management Statement 2010	2010	2010-2020	Tas/PWS	1	Current
Narawntapu National Park, Hawley Nature Reserve Management Plan 2015 (Draft)	2015	2015-2025	Tas/PWS	2	Draft
Narawntapu National Park, Hawley Nature Reserve Management Plan 2000	2000	Not specified	Tas/PWS	2	Current
Small North-East Islands Draft Management Plan 2002	2002	Not specified	Tas/PWS	10	Draft
North East River Game Reserve Management Plan 1999	1999	Not specified	Tas/PWS	2	Current
Pitt Water Nature Reserve Management Plan 2013	2013	2013-2023	Tas/PWS	1	Current
Savage River National Park and Savage River Regional Reserve Draft Management Plan 2001	2001	Not specified	Tas/PWS	2	Draft
Small Bass Strait Island Reserves Draft Management Plan October 2000	2000	Not specified	Tas/PWS/Coastcare	12	Draft

Title of statutory management plan	**Date of plan**	**Period covered by the plan**	**Jurisdiction/Managers**	**No. of PAs covered**	**Plan status**
South Bruny National Park, Waterfall Creek State Reserve, Green Island Nature Reserve Management Plan 2000	2000	Not specified	Tas/PWS	3	Current
Small South-East Islands Draft Management Plan 2002	2002	Not specified	Tas/PWS	11	Draft
Southport Lagoon Conservation Area, George III Monument Historic Site & Ida Bay State Reserve Management Plan 2006	2006	Not specified	Tas/PWS	3	Current
Strzelecki National Park Management Plan 2000	2000	Not specified	Tas/PWS	1	Current
Tasman National Park and Reserves Management Plan 2011	2011	Not specified	Tas/PWS	7	Current
Tasmanian Wilderness World Heritage Area Management Plan 1999 (1999, incorporating an update in 2007)	1999	1999-2009	Tas/PWS/Cth government	40	Current
The Nut State Reserve Management Plan March 2003	2003	Not specified	Tas/PWS	1	Current
Trevallyn Nature Recreation Area Management Plan 2008	2008	2008-2028	Tas/PWS	1	Current
Tasmanian Wilderness World Heritage Area Management Plan 2014 (Draft)[in Ch6, references point to the final iteration of this plan: TWWHA MP 2016]	2014	2014-2024	Tas/PWS/Cth government	74	Draft
Tasmanian Wilderness World Heritage Area Management Plan Update 2007	2007	1999-2007	Tas/PWS	n/a	Addendum
Waterhouse Conservation Area Management Plan 2003	2003	Not specified	Tas/PWS	1	Current
Wellington Park Management Plan 2013 (as amended 2015)	2013	2014-2024	Wellington Park Management Trust	1	Current

Title of statutory management plan	**Date of plan**	**Period covered by the plan**	**Jurisdiction/Managers**	**No. of PAs covered**	**Plan status**
Wingaroo Nature Reserve and Wingaroo Conservation Area Management Plan 2000	2000	2000 - 2010	Tas/PWS	2	Current
Woodvine Nature Reserve Management Statement 2010	2010	2010-2020	Tas/PWS	1	Current
Greater Alpine National Parks Draft Management Plan 2014	2014	Until final plan released	Vic/PV	12	Draft
Balmattum Nature Conservation Reserve Interim Management Statement 2001	2001	Not specified	Vic/PV	1	Interim
Barmah State Park and Forest Management Plan 1992	1992	Not specified	Vic/PV	2	Current
Baw Baw National Park Management Plan 2005	2005	2005-2015	Vic/PV	1	Current
Beechworth Historic Park Management Plan 2007	2007	Not specified	Vic/PV	1	Current
Bendoc Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Big Desert Wilderness Management Plan 1994	1994	Not specified	Vic/PV	1	Current
Black Range State Park Management Plan 1998	1998	Not specified	Vic/PV	1	Current
Blacks Creek Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Boonderoo Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Brisbane Ranges National Park Management Plan 1997	1997	Not specified	Vic/PV	1	Current

Title of statutory management plan	**Date of plan**	**Period covered by the plan**	**Jurisdiction/Managers**	**No. of PAs covered**	**Plan status**
Broken Boosey State Park Management Plan 2006	2006	2006-2016	Vic/PV	5	Current
Bunyip State Park 1998	1998	Not specified	Vic/PV	1	Current
Burrowa Pine Mountain National Park Plan 1996	1996	Not specified	Vic/PV	1	Current
Cape Liptrap Coastal Park Management Plan 2003	2003	Not specified	Vic/PV	1	Current
Cape Conran Coastal Park Management Plan 2005	2005	2005-2015	Vic/PV	1	Current
Castlemaine Diggings National Heritage Park Management Plan 2007	2007	2007-2017	Vic/PV	1	Current
Cathedral Range State Park Plan 1998 (re-issued in 2009)	1998	1998-2009 (+5 years)	Vic/PV	1	Current
Chiltern Mount-Pilot National Park Management Plan 2008-2018	2008	2008-2018	Vic/PV	1	Current
Churchill National Park Lysterfield Park Plan 1998 (re-issued in 2009)	1998	1998-2009 (+5 years)	Vic/PV	2	Current
Coopracambra National Park Management Plan 1998	1998	Not specified	Vic/PV	1	Current
Croajingolong National Park Plan 1996	1996	Not specified	Vic/PV	1	Current
Dandenong Ranges National Park Management Plan 2006	2006	Not specified	Vic/PV	1	Current
Dergholm and Mt Arapiles Tooan State Park Management Plan 1998 (updated)	1998	Not specified	Vic/PV	1	Current

Title of statutory management plan	**Date of plan**	**Period covered by the plan**	**Jurisdiction/Managers**	**No. of PAs covered**	**Plan status**
Devilbend Natural Features Reserve Management Plan 2010	2010	2010-2020	Vic/PV/the Boonwurrung people	1	Current
Dreeite Nature Conservation Reserve Management Statement 2005	2005	2005-2015	Vic/PV	1	Current
Enfield State Park Management Plan 1998	1998	Not specified	Vic/PV	1	Current
Errinundra National Park Management Plan 1996	1996	Not specified	Vic/PV	1	Current
French Island National Park Management Plan 1998	1998	Not specified	Vic/PV	1	Current
Grampians National Park Management Plan 2003	2003	Not specified	Vic/PV	1	Current
Greater Bendigo National Park Management Plan 2007	2007	2007-2017	Vic/PV	1	Current
Great Otway National Park and Forest Park Management Plan 2009	2009	Not specified	Vic/PV	2	Current
Green Hills Nature Conservation Reserve 2005	2005	Not specified	Vic/PV	1	Current
Heathcote-Graytown National Park and Spring Creek Nature Conservation Reserve Management Plan 2008	2008	2008-2018	Vic/PV	2	Current
Holey Plains State Plan Management Plan 1998 (re-issued in 2009)	1998	1998-2009 (+5 years)	Vic/PV	1	Current
Kangaroo Swamp Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Kara Kara National Park Management Plan 2013	2013	2013-2023	Vic/PV	1	Current

Title of statutory management plan	Date of plan	Period covered by the plan	Jurisdiction/Managers	No. of PAs covered	Plan status
Kinglake National Park Management Plan 1996	1996	Not specified	Vic/PV	1	Current
Kings Billabong Wildlife Reserve Management Plan 2008	2008	2008-2018	Vic/PV/Mallee Catchment Management Authority	1	Current
Kooyoora State Park Management Plan 2010	2010	2010-2020	Vic/PV	1	Current
Kotta Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Lake Eildon National Park Management Plan 1997(re-issued 2009)	1997	1997-2009 (+5 years)	Vic/PV	1	Current
Lake Wellington Wetlands Management Plan 2008	2008	2008-2018	Vic/PV	7	Current
Langi Ghiran State Park Plan 1996	1996	Not specified	Vic/PV	1	Current
Langwarrin Flora and Fauna Reserve Management Plan 2002	2002	Not specified	Vic/PV	1	Current
Leaghur State Park Plan 1998	1998	Not specified	Vic/PV	1	Current
Lerderderg State Park & Werribee Gorge State Park Management Plan 1999 (re-issued in 2009)	1999	1999-2009 (+5 years)	Vic/PV	2	Current
Lind and Alfred National Parks 1998 (re-issued 2009)	1998	1998-2009 (+5 years)	Vic/PV	2	Current
Little Desert National Park Management Plan 1996	1996	Not specified	Vic/PV	1	Current
Long Forest Nature Conservation Reserve Management Plan 2003	2003	Not specified	Vic/PV	1	Current

Title of statutory management plan	Date of plan	Period covered by the plan	Jurisdiction/Managers	No. of PAs covered	Plan status
Macleod Morass and Jones Bay Wildlife Reserves Management Plan 2005	2005	2005-2015	Vic/PV	2	Current
Mallee Parks Management Plan 1996	1996	Not specified	Vic/PV	5	Current
Mitchell River National Park Management Plan 1998	1998	Not specified	Vic/PV	1	Current
Moodemere Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Moondarra State Park and Tyers Park Management Plan 1991	1991	Not specified	Vic/PV	2	Current
Mornington Peninsula National Park and Arthurs Seat State Park 1998 (re-issued in 2013)	1998	Not specified	Vic/PV	2	Current
Morwell National Park Management Plan 1998	1998	Not specified	Vic/PV	1	Current
Mount Arapiles-Tooan State Park Management Plan 1991	1991	1991-1996	Vic/PV	1	Current
Mount Buangor State Park Plan 1996	1996	Not specified	Vic/PV	1	Current
Mount Buffalo National Park Management Plan 1996	1996	Not specified	Vic/PV	1	Current
Mount Granya and Mount Lawson State Parks Plan 1998 (re-issued in 2009)	1996	1998-2009 (+5 years)	Vic/PV	2	Current
Mount Samaria State Park Plan 1996 (re-issued in 2009)	1996	1996-2009 (+5 years)	Vic/PV	1	Current

Title of statutory management plan	Date of plan	Period covered by the plan	Jurisdiction/Managers	No. of PAs covered	Plan status
Mount Mercer Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Ngootyoong Gunditj Ngootyoong Mara South West Management Plan 2015	2015	2015-2030	Vic/PV/Gunditj Mirring Traditional Owners Aboriginal Corporation, Budj Bim Council	146	Current
Organ Pipes National Park Management Plan 1998	1998	Not specified	Vic/PV	1	Current
Paddys Ranges State Park Management Plan 2010	2010	2010-2020	Vic/PV	1	Current
Pine Grove Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Alpine National Park Bogong Unit Management Plan 1992	1992	Not specified	Vic/PV	1	Current
Alpine National Park Cobberas Unit Management Plan 1992	1992	Not specified	Vic/PV	1	Current
Alpine National Park Dartmouth Unit Management Plan 1992	1992	Not specified	Vic/PV	1	Current
Alpine National Park Wonnangatta Unit Management Plan 1992	1992	Not specified	Vic/PV	1	Current
Anglesea Heath Management Plan 2002	2002	2002-2012	Vic/PV/Alcoa	1	Current
Point Nepean National Park and Quarantine Station 2009	2009	2009-2019	Vic/PV/Point Nepean Community Trust	2	Current
Pomborneit North Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current

Title of statutory management plan	Date of plan	Period covered by the plan	Jurisdiction/Managers	No. of PAs covered	Plan status
Port Campbell National Park and Bay of Islands Coastal Park Management Plan 1998	1998	Not specified	Vic/PV	2	Current
Reef Hills State Park Management Plan 2007	2007	2007-2017	Vic/PV	1	Current
Ridge Paddock Nature Conservation Reserve (addition to Cobra Killuc Wildlife Reserve) Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Roslynmead Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Rutherglen Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Snowy River National Park Management Plan 1995	1995	Not specified	Vic/PV	1	Current
Steiglitz Historic Park Management Plan 1996 (re-issued in 2009)	1996	1996-2010 (+5 years)	Vic/PV	1	Current
Swallow Lagoon Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Tarra Bulga National Park Management Plan 1996	1996	Not specified	Vic/PV	1	Current
Terrick Terrick East Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Terrick Terrick National Park Management Plan 2004	2004	Not specified	Vic/PV	1	Current
The Lakes National Park & Gippsland Lakes Coastal Park Plan 1998	1998	Not specified	Vic/PV	2	Current

Title of statutory management plan	**Date of plan**	**Period covered by the plan**	**Jurisdiction/Managers**	**No. of PAs covered**	**Plan status**
Wabba Wilderness Park Management Plan 1995 (re-issued in 2009)	1995	1995-2009 (+5 years)	Vic/PV	1	Current
Wallaby Creek Catchment Area Kinglake National Park Management Plan 1998	1998	Not specified	Vic/PV/Melbourne Water Corporation	1	Current
Wanurp Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current
Warby Range State Park Draft Management Plan 2006	2006	Not Applicable	Vic/PV	1	Draft
Warrandyte State Park Management Plan 2006	2006	2006-2016	Vic/PV	1	Current
Wilsons Promontory National Park Management Plan 2002	2002	Not specified	Vic/PV	3	Current
Woodlands Historic Park Management Plan 1997	1997	Not specified	Vic/PV	1	Current
Yarra Ranges National Park Management Plan 2002	2002	Not specified	Vic/PV/Melbourne Water Corporation	1	Current
Yarra Valley Parklands Management Plan 2008	2008	2008-2023	Vic/PV	10	Current
Yellingbo Nature Conservation Reserve Management Plan 2004	2004	2004-2014	Vic/PV/Trust for Nature	1	Current
Youanmite Nature Conservation Reserve Management Statement 2005	2005	Not specified	Vic/PV	1	Current

A.5: Permission to use published work

McCormack, Phillipa C, 'Conservation introductions for biodiversity adaptation under climate change' (2018) (first view online) *Transnational Environmental Law* 1

Phillipa McCormack

From:	Heyvaert,V <V.Heyvaert@lse.ac.uk>
Sent:	Thursday, 5 October 2017 10:47 PM
To:	Phillipa McCormack; TEL@cambridge.org
Cc:	T.F.M.Etty@auc.nl; Rebecca O'Rourke (rorourke@cambridge.org)
Subject:	RE: TEL - Decision on TEL-031-2017.R1

Dear Philippa,

Thank you for your email. We are happy to confirm that your publication in *TEL* will not stand in the way of you using the work as a chapter of your PhD.

With best wishes,

Veerle and Thijs

From: Phillipa McCormack [mailto:phillipa.mccormack@utas.edu.au]
Sent: 05 October 2017 00:30
To: TEL@cambridge.org
Cc: T.F.M.Etty@auc.nl; Heyvaert,V
Subject: RE: TEL - Decision on TEL-031-2017.R1

Dear Editors-in-Chief

Thank you for your email and for confirmation that my manuscript has been accepted. This is wonderful news!

I am looking forward to working through the final revisions, and will ensure that I return the final manuscript to you by 23 October.

Given that this manuscript draws on my doctoral research, I plan to reproduce parts of the manuscript in chapter 8 of my PhD thesis. Would you be willing to give me permission to use my TEL article in that way? I undertake to appropriately acknowledge the chapter as comprising content originally published in TEL, as follows:

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My thesis, once reviewed and accepted, will be made available online via the University of Tasmania's digital repository.

I hope to hear from you soon.

Kind regards
Phillipa

McCormack, Phillipa and Jan McDonald, 'Adaptation strategies for biodiversity conservation: has Australian law got what it takes?' (2014) 31 *Environmental and Planning Law Journal* 114

Phillipa McCormack

From:	lta.permissions@thomsonreuters.com
Sent:	Tuesday, 9 January 2018 10:49 AM
To:	Phillipa McCormack
Subject:	RE: Seeking permission to use sections of an article that I published in the EPLJ, in a chapter of my PhD thesis
Follow Up Flag:	Follow up
Flag Status:	Flagged

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Maki

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From: Phillipa McCormack [mailto:phillipa.mccormack@utas.edu.au]
Sent: Monday, 8 January 2018 11:00 AM
To: Permissions, TLRANZ
Subject: Seeking permission to use sections of an article that I published in the EPLJ, in a chapter of my PhD thesis

Dear Permissions Officer

I published an article in the *Environmental and Planning Law Journal* in 2014, with the citation: P McCormack and J McDonald, 'Adaptation strategies for biodiversity conservation: Has Australian law got what it takes?' (2014) 31 *EPLJ* 114.

Research for that article was part of my early doctoral research. I will be submitting my PhD thesis for examination this month, and I would like to reproduce parts of the EPLJ article in my thesis chapter 3 – especially the figure from that article on page 117. Would you be willing to give me permission to use the article in this way? If so, I understand that I need to fill out a Permission Request Form for Authors?

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My thesis, once reviewed and accepted, will be made available online via the University of Tasmania's digital repository.

I hope to hear from you soon.

Kind regards

3

McCormack, Phillipa C, 'The legislative challenge of facilitating climate change adaptation for biodiversity' (2018) *Australian Law Journal* (forthcoming)

Phillipa McCormack

From:	cheryle.king@thomsonreuters.com
Sent:	Thursday, 18 January 2018 12:24 PM
To:	Phillipa McCormack
Subject:	RE: URGENT: PERMISSION NEEDED

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Kind regards
Cheryle

Cheryle King
Senior Editor – *Australian Law Journal*
Thomson Reuters
Level 6, 19 Harris Street, Pyrmont NSW 2009
legal.thomsonreuters.com.au

From: Phillipa McCormack [mailto:phillipa.mccormack@utas.edu.au]
Sent: Thursday, 18 January 2018 10:21 AM
To: King, Cheryle K. (Legal)
Subject: URGENT: PERMISSION NEEDED
Importance: High

Dear Cheryle

I am writing to follow up on my email, below.

I will be submitting my PhD thesis tomorrow. I need permission from the *Australian Law Journal* (or perhaps from the publisher?) to include parts of my article in a chapter of my thesis. I cannot simply leave the chapter out, so I hope that I will hear from you sometime today!

I am happy to undertake *not* to make the thesis available online until *after* the relevant ALJ edition goes to press, if that would help.

Kind regards
Phillipa

Phillipa C McCormack
PhD candidate | Faculty of Law, University of Tasmania
m: +61 419 360 244 | t: @PhilMack